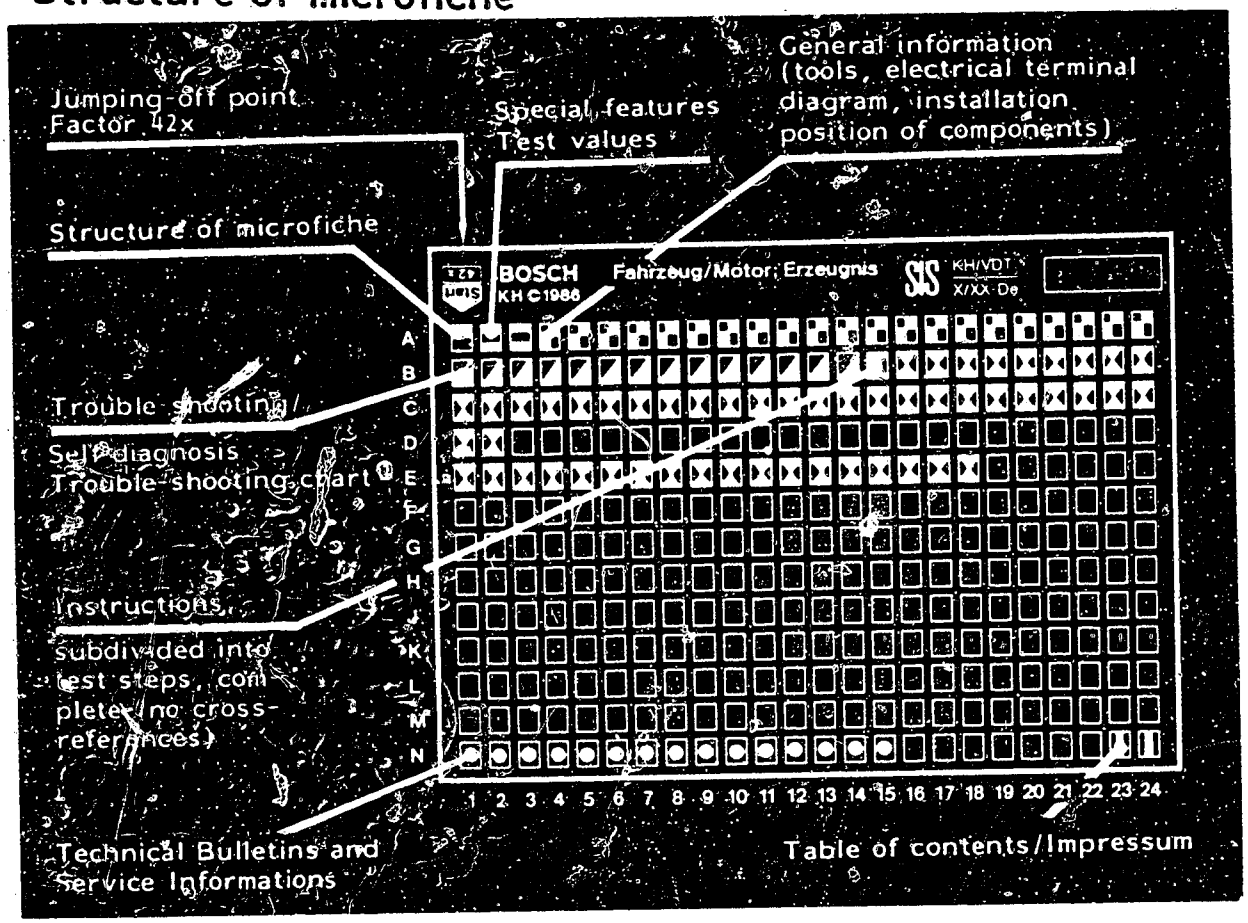
Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

E16	Product/component/test step Vehicle/engine

Coordinate

3. Limits of section

Beginning — Mid-section — End — One-page section

4. References to relevant test steps in test specifications; coordinate e.g. C6

C6

A1	Trouble-shooting program	↓

1. Special features

Ford Escort with catalytic converter equipped as of 1985 with:

Trigger box	0 227 100 124 (with current limitation)
Ignition coil	1 227 020 017
EZ-K control unit	0 227 400 101
Knock sensor	0 261 231 001

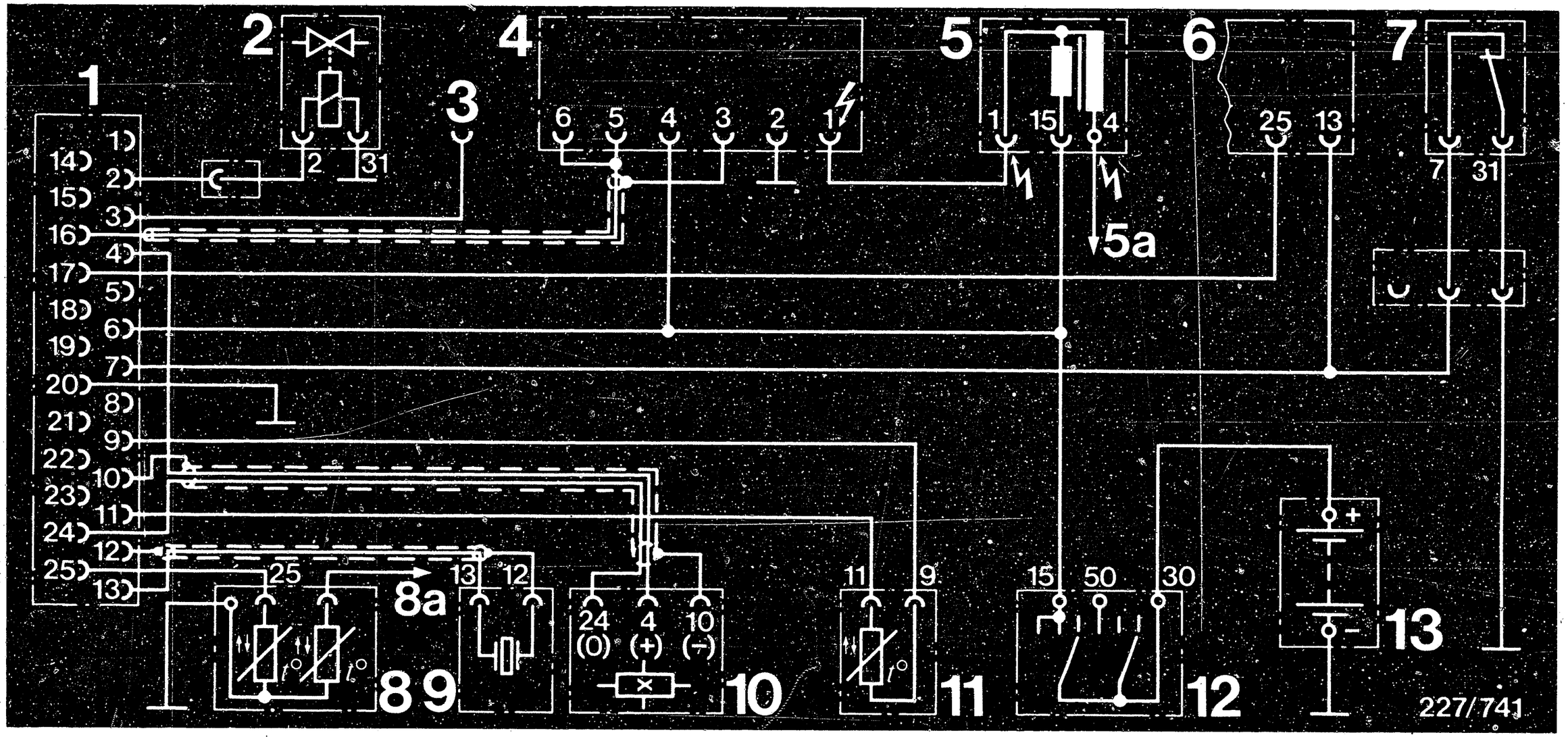
2. Test specifications

Ignition coil primary		0.6 ... 1.1 Ω	B17
Ignition coil, secondary		6.4 ... 11.1 Ω	
Dwell angle at cranking speed		27 ... 33 %	B21
Basic ignition timing at To prevent incorrect setting, be sure to test as described on coordinates on right		12 ± 1° BTDC 900 ± 25 min^{-1}	C3 → C5
Solenoid-operated valve (Idle compensation)		24 ... 40 Ω	C7
Engine idle		900 ± 25 min^{-1}	
Idle compensation		750 ... 950 min^{-1}	
Coolant-temperature sensor	+20°C	2.1 ... 3.0 kΩ	C9
	+30°C	1.4 ... 2.0 kΩ	
	+80°C	280 ... 380 Ω	
	+90°C	210 ... 280 Ω	
	100°C	160 ... 220 Ω	

Test specifications (continued)

Intake-air temperature sensor	+10°C	0.92 ... 0.99 kΩ	C11
	+20°C	0.97 ... 1.04 kΩ	
	+30°C	1.02 ... 1.09 kΩ	
	+40°C	1.06 ... 1.14 kΩ	
	+50°C	1.11 ... 1.19 kΩ	
Knock sensor		270 ... 330 kΩ	C15
Knock-sensor tightening torque		11 ... 15 Nm	
Trigger box power supply		12 ... 14 V	C23
Ignition coil power supply		≥ 10 V	
Primary voltage with engine idling		295 ... 365 V	D1
Ignition pulse generator power supply with ignition on		≥ 10 V	E9

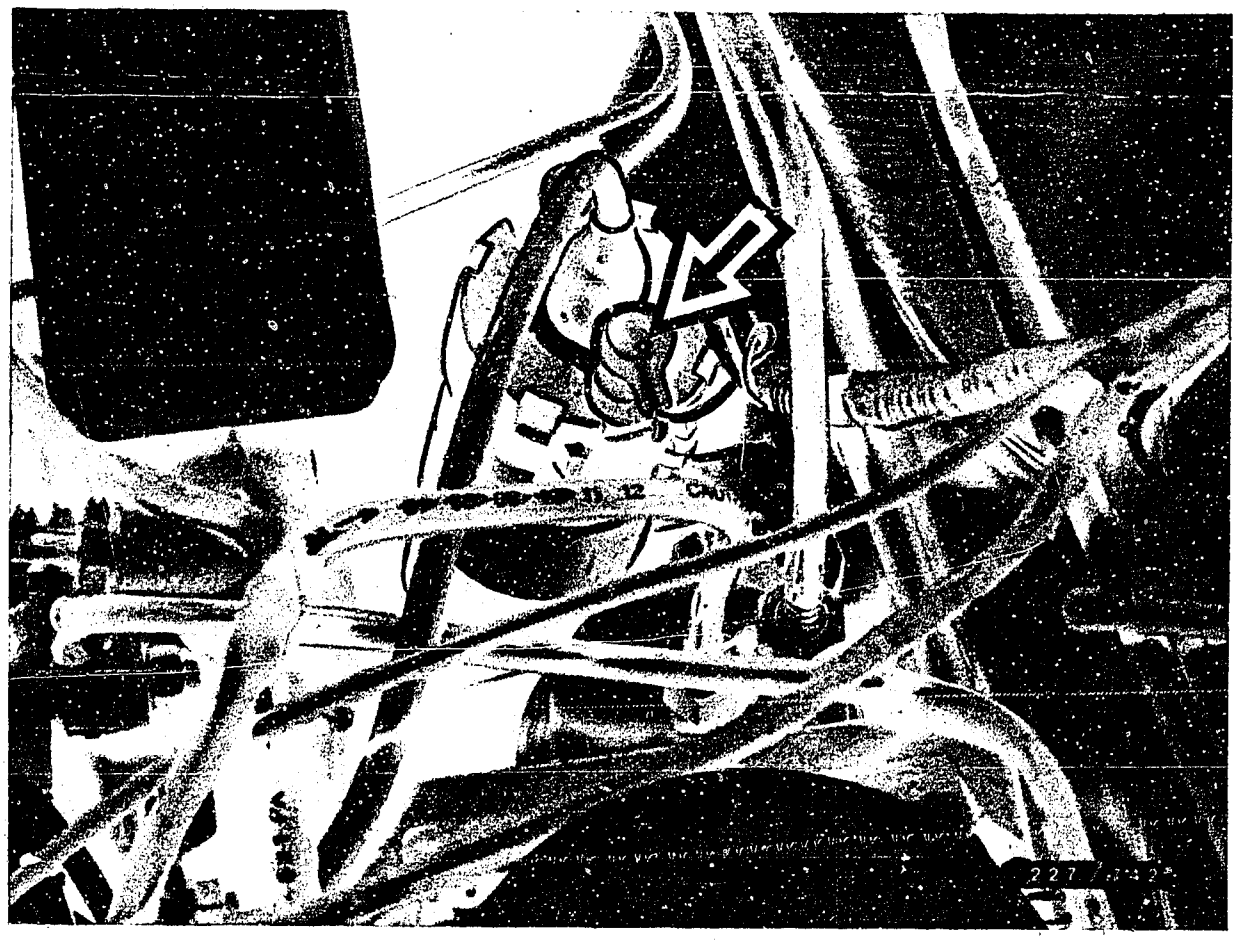
See Autodata test specifications for settings for idle speed, exhaust gas, valve clearance etc.



Danger arrows: Warning: 400 V ... 25 kV

1 = EZ-K control unit
2 = Idle-compensation solenoid-op. valve
3 = Diagnostic connection
4 = Trigger box
5 = Ignition coil
5a = To ignition distributor
6 = KE-Jetronic control unit
7 = Microswitch - idle contact
8 = Coolant temperature sensor (double NTC)
8a = To KE-Jetronic
9 = Knock sensor
10 = Ignition distributor
11 = Intake-air temperature sensor (PTC)
12 = Ignition/starting switch
13 = Battery

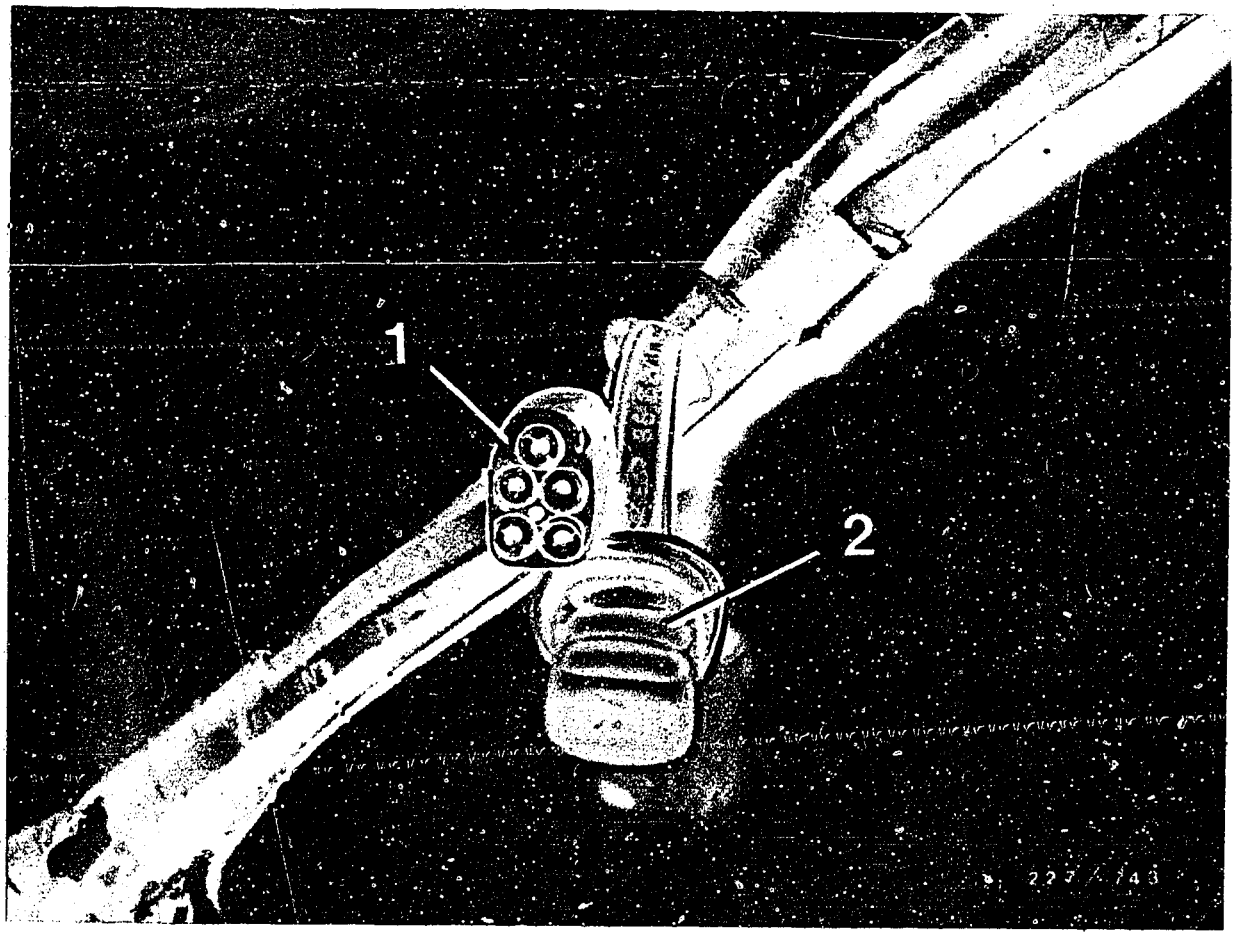
3. Electrical terminal diagram



Arrow = ignition coil with trigger box

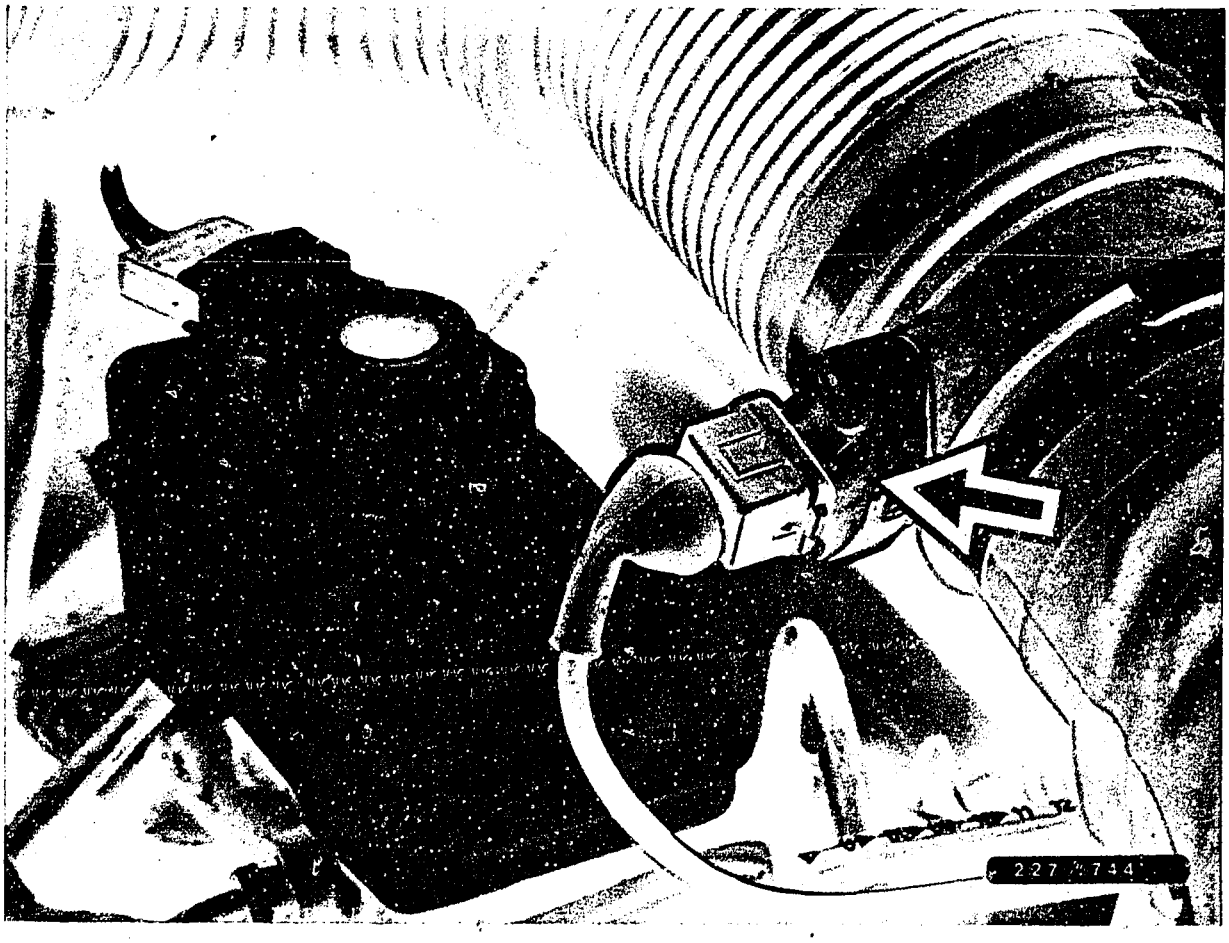
4. Installation position of components

Trigger box and ignition coil are mounted on a heat sink and are accommodated in the engine compartment on the left (near brake master cylinder).



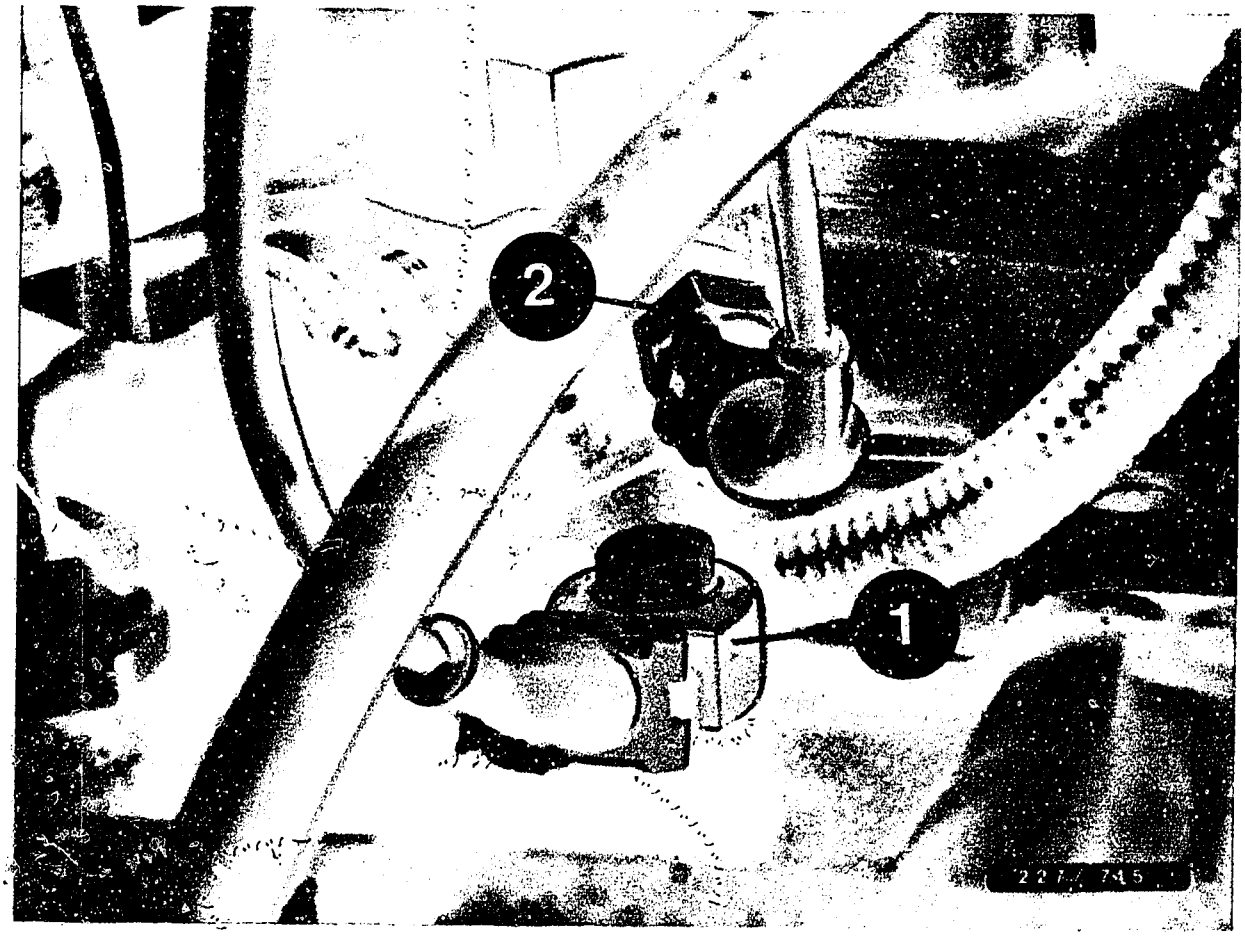
1 = Diagnostic connection
2 = Cover plate

Diagnostic connection is on wiring harness (wheel housing on left).



Arrow = Intake-air temperature sensor

Intake-air temperature sensor is mounted in the intake manifold between mixture-control unit and throttle valve.



1 = Knock sensor)
2 = Coolant-temperature sensor) (shown from below)

Knock sensor is on engine block - underneath intake manifold.

Notes:
Note installation position of knock sensor (connection at bottom). See picture.

Mount fastening screw of knock sensor without plain washer, spring lock washer, tooth lock washer etc.

Tightening torque 11 ... 15 Nm.

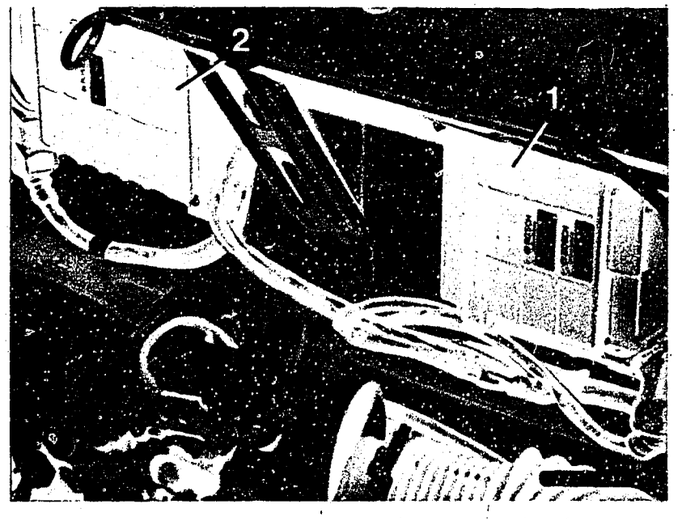
Lock fastening screw with locking paint only.

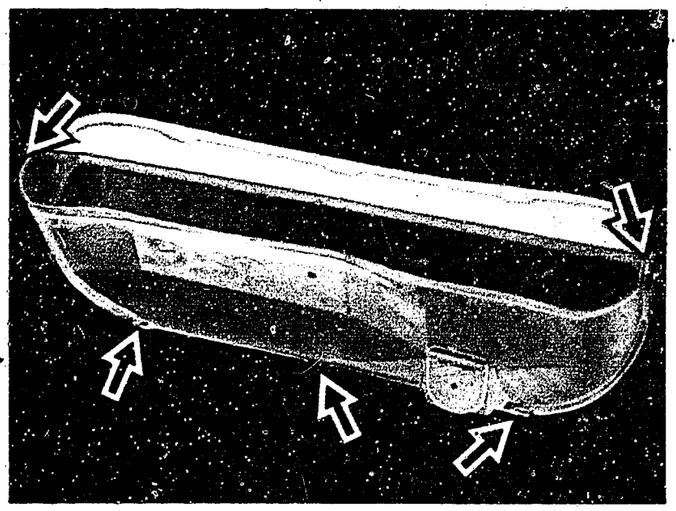
Coolant-temperature sensor is on cylinder head underneath intake manifold.

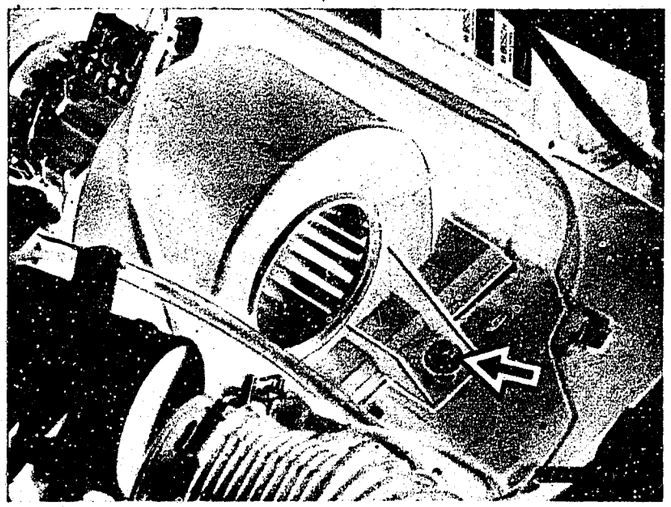
EZ-K control unit (top picture Item 1) and KE-Jetronic control unit (top picture Item 2) are behind the heater blower.

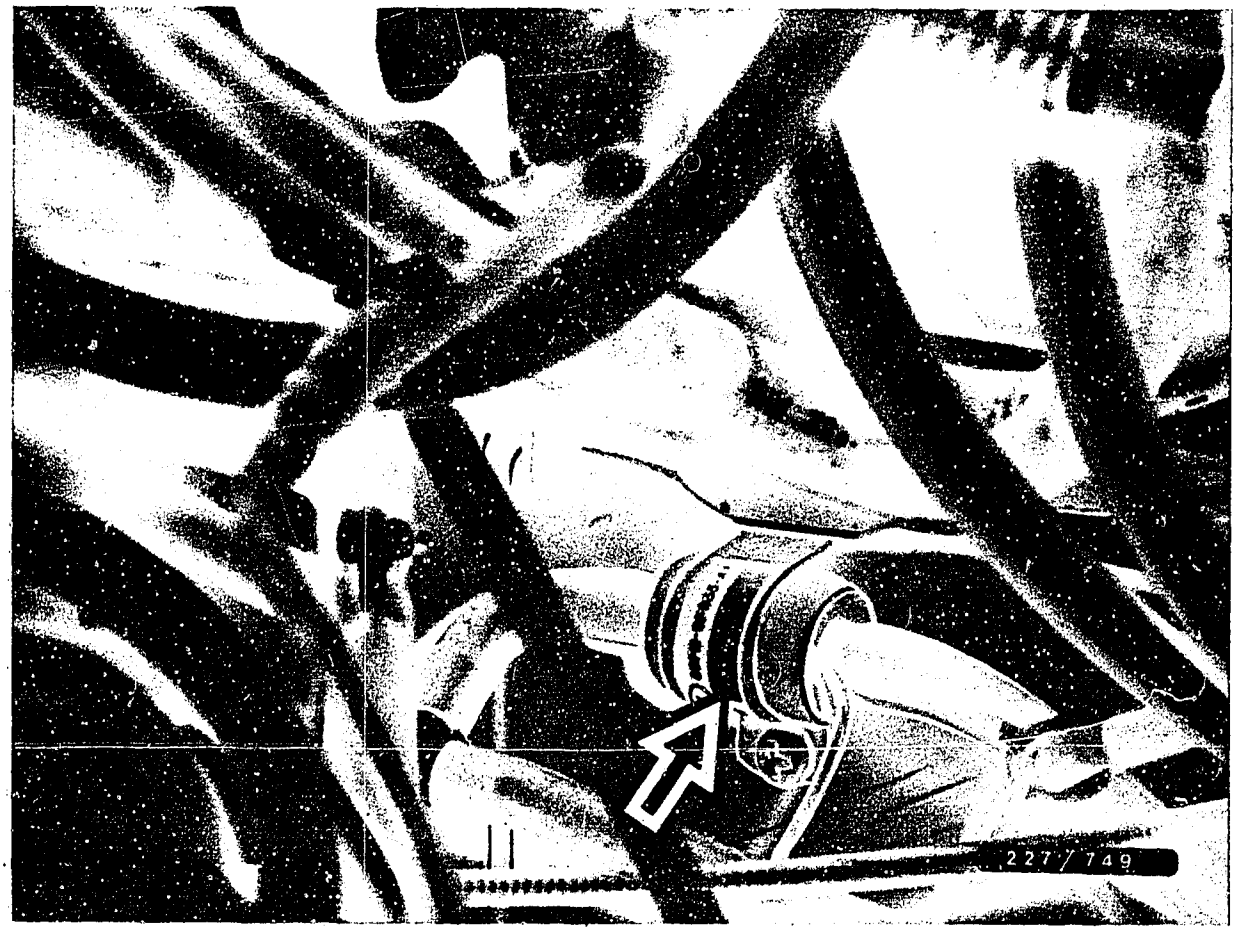
How to remove:

Remove rubber surround (not shown) from heater-blower shaft and loosen clamps (arrow in center picture). Take off front part of blower shaft.
Unscrew both nuts from heater blower (arrow, bottom picture) and remove complete heater blower.



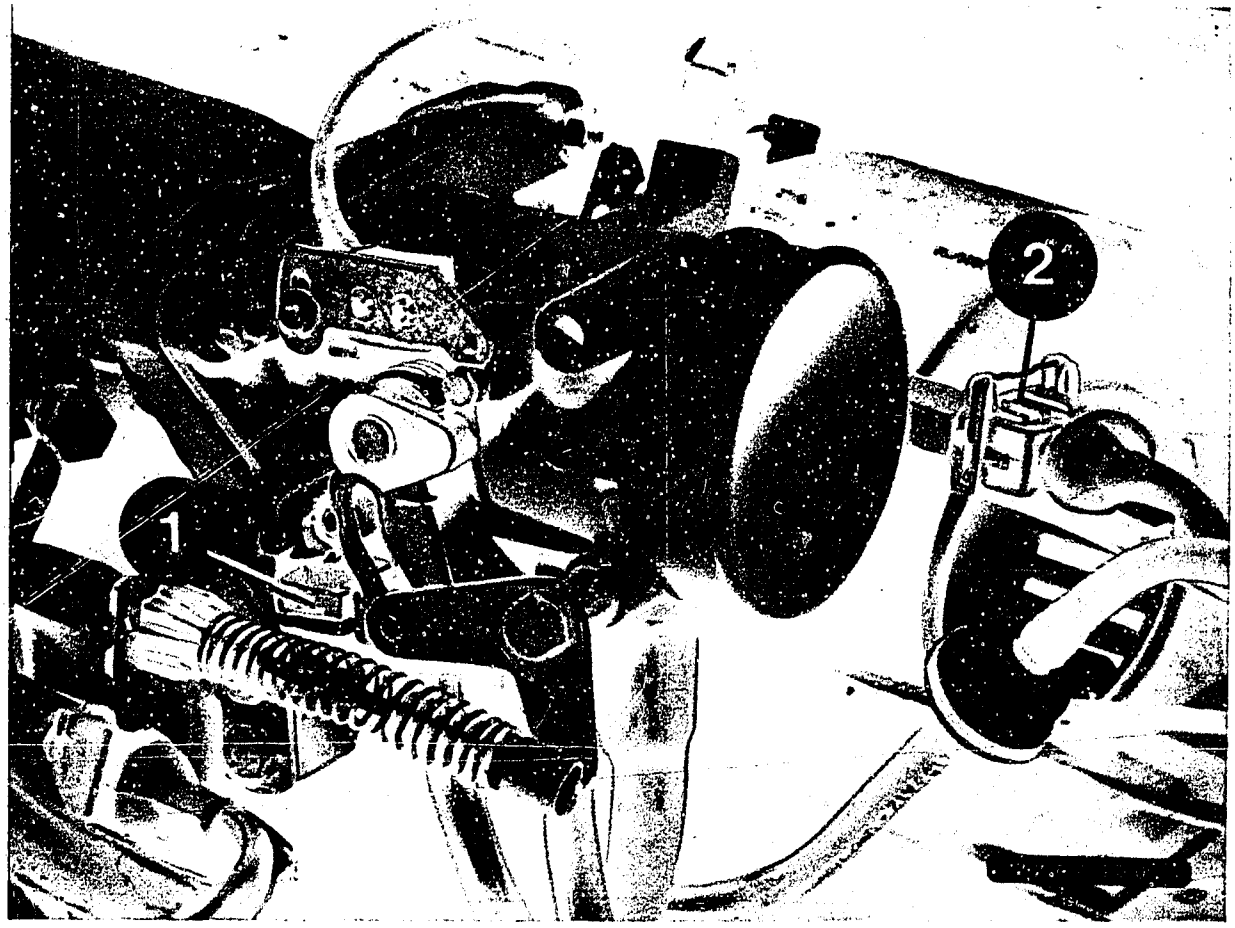






Arrow = idle-compensation solenoid-operated valve

Solenoid-operated valve is on engine firewall (at height of oil filter).



1 = Microswitch - idle contact
2 = Plug connector (idle - full-load contact)

5. Necessary test equipment and auxiliaries

Motortester e.g.	MOT 201	0 684 000 201
Pulse shaper (required for measuring primary voltage with MOT 201, 202 and 400)		1 684 463 154
Spark gap e.g. ignition-coil and condenser tester	EFAW 106A	0 681 100 001
or single spark gap	EF 1177/7	1 684 531 000
Sleeve-type suppressor 5 kΩ		0 356 500 001
Ohmmeter	ETE 014.00	0 684 101 400
or e.g.	Pontavi Wh 2	Commercially available
Voltmeter e.g.	ETE 014.00	0 684 101 400
Analog voltmeter (multimeter) for measuring voltage pulses for self-diagnosis		Commercially available

Necessary test equipment and auxiliaries (continued)

Test leads (for proper connection of test equipment at connectors).	KDZS 0004
Test prod, red	1 684 485 035
Test prod, black (for proper connection of test equipment and connectors)	1 684 485 034
Thermal conduction paste	5 942 860 003
Screw-locking paint 30 g	5 703 245 003
Torque wrench 5 ... 60 Nm range	commercially available
Adapters for ignition coil and	1 684 448 115 1 684 448 117

6. Incorrect speed, dwell angle and firing point display

Incorrect indication of speed, dwell angle and firing point by test equipment may occur in ignition systems with control unit 0 227 100 124 (TZ-I) incorporating current limitation.

See coordinates N 10 - N 14 for additional information.

7. Hazards in electronic ignition systems

Increased demands placed on ignition systems by modern engines, as well as the desire for reduced maintenance, caused electronic ignition systems to be introduced as standard equipment some time ago.

As a rule, the power supplied by nearly all electronic ignition systems exceeds that of conventional systems, and further increases are expected. Thus electronic ignition systems are within a power range where contact with live parts or terminals can be extremely hazardous (on both the primary and secondary sides).

We therefore recommend that any work or tests performed on the ignition system be in accordance with VDE Regulations (Association of German Electrical Engineers), particularly VDE 0104 dated July, 1967, as well as all pertinent national regulations.

The ignition must always be switched off when work is performed on the ignition system (switch off ignition and/or power supply).

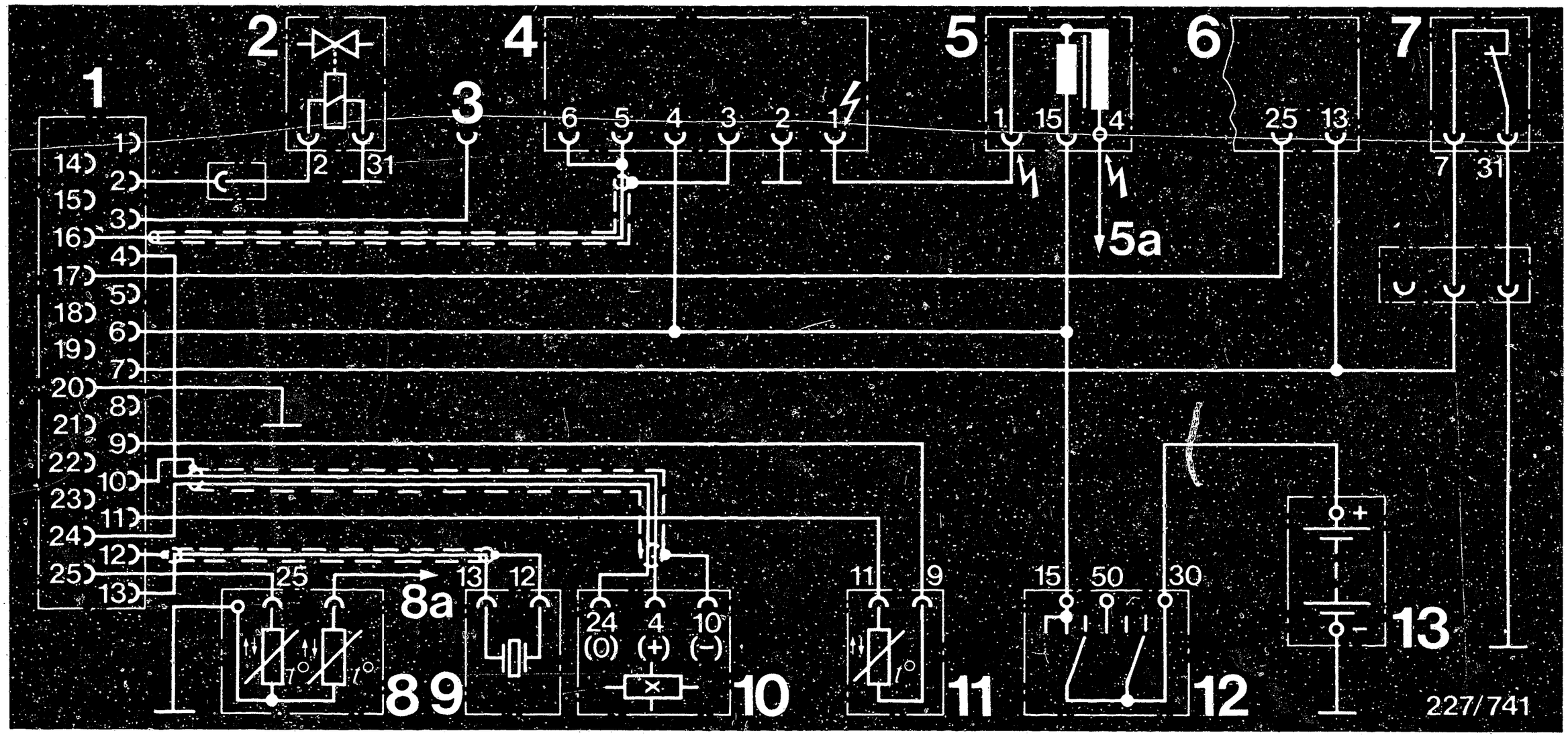
This work includes:

- attaching engine testers (timing light, dwell-tach tester, ignition oscilloscope, etc.)

- replacing ignition system parts (spark plug, ignition coil, ignition distributor, ignition cable, etc.)

If, when checking the ignition system or when performing adjustments of the engine (e.g. mixture preparation), it becomes necessary to switch on the ignition (ignition/ voltage source), the above-mentioned dangerous voltages occur over the entire system.

Hazards therefore exist not only within the individual subassemblies of the ignition system (e.g. ignition distributor, ignition coil, control unit, ignition harness), but also at the wiring harness (e.g. tachometer connector, diagnostic connector), plug connection cables and test equipment.



Danger arrows: Warning: 400 V ... 25 kV

1 = EZ-K control unit
2 = Idle-compensation solenoid-op. valve
3 = Diagnostic connection
4 = Trigger box
5 = Ignition coil
5a = To ignition distributor
6 = KE-Jetronic control unit
7 = Microswitch - idle contact
8 = Coolant temperature sensor (double NTC)
8a = To KE-Jetronic
9 = Knock sensor
10 = Ignition distributor
11 = Intake-air temperature sensor (PTC)
12 = Ignition/starting switch
13 = Battery

The dangerous locations are identified by danger arrows taking the example of the terminal diagram of an electronic ignition system.

8. Important vehicle information

- Conduct resistance measurements only with ignition switched off or battery disconnected (tester defective)

- When compression-testing, disconnect ignition-distributor plug or firmly ground ignition coil term. 4 with auxiliary cable (dangerous high voltage, insulation damage on ignition coil, ignition distributor, ignition harness).

  Note:
  Auxiliary cable must have at least 2 kΩ suppression, e.g. 5 kΩ sleeve-type suppressor 0 356 500 001.

- Do not replace specified ignition coil (see part No.) with a different type of ignition coil.

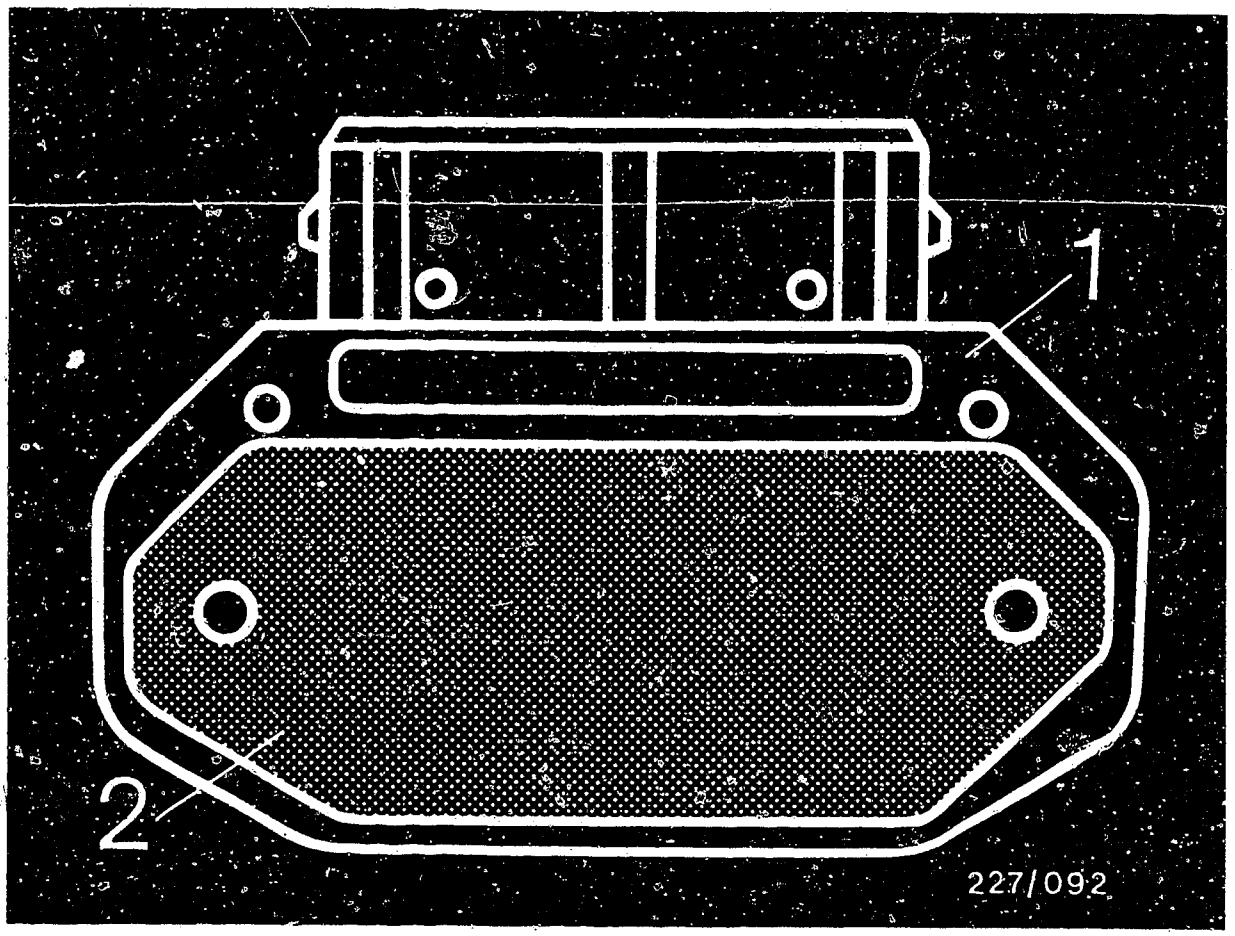
- Do not connect a suppression capacitor to ignition coil terminal 1.

- Do not connect ignition coil terminal 1 to ground as an anti-theft measure (when ignition is switched "on" ignition coil will be destroyed).

- Do not connect a positive battery terminal or test lamp to ignition coil terminal 1 (control unit will be destroyed).

- Do not remove the high voltage ignition cable between ignition coil terminal 4 and ignition distributor terminal 4 with the engine running.

- Flashover from ignition coil terminal 4 to ignition coil terminals 1 and 15 must be prevented. The magnetic pulse generator and control unit could be destroyed.



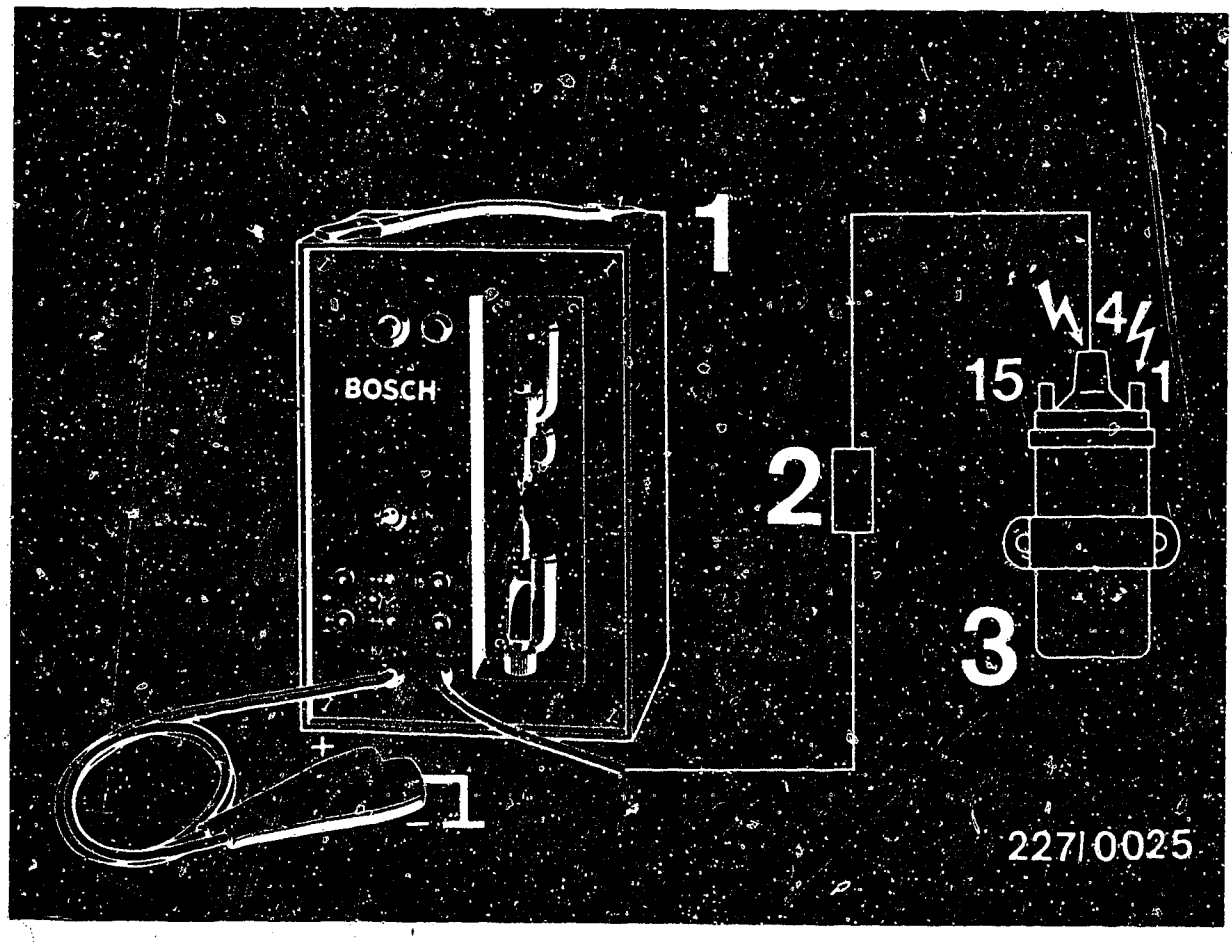
1 = Control unit

2 = Baseplate

- Coat baseplate with thermal conduction paste before mounting control unit.

  Use only suitable object (screwdriver, match, etc.) to apply paste.

  Keep thermal conduction paste off painted parts.



1 = Spark discharge tester
2 = 5 kΩ sleeve-type suppressor
3 = Ignition coil

Danger arrows: 400 V ... 25 kV

- To-prevent damage to the control unit when using a spark discharge tester, a suppression resistor of at least 2 kΩ must be connected between the spark discharge tester and ignition coil terminal 4 (e.g. 5 kΩ sleeve-type suppressor 0 356 500 001) to prevent damage to the control unit.

- To prevent damage to the control unit, a suppression resistance of at least 2 kΩ must be connected to the secondary side of the ignition system. The original distributor rotor must be installed with a 1 kΩ suppression resistor (also do not use a 5 kΩ distributor rotor for radio interference suppression).

- Do not attach any external voltage source such as an ohmmeter to the magnetic pulse generator (hall generator).
  Use caution when switching meter ranges.

- Leads from ignition pulse generator to EZ-K control unit and from EZ-K control unit to trigger box must be shielded (malfunction of EZ-K control unit/trigger box.

- Flashover or punchthrough at ignition distributor cap (poor insulation) may destroy the magnetic pulse generator and the control unit.

- Do not disconnect battery terminals with engine running.

- Do not assist starting at more than 16 volts or with a fast charger.

- In the case of incorrect battery polarity, ignition pulse generator, trigger box and ignition coil as well as EZ-K control unit will be destroyed.

- Knock sensor cable must be shielded and routed separate from high voltage cables.

- Attach mounting bolt of knock sensor w i t h o u t plain washer, spring lock washer, tooth lock washer, etc. Secure mounting bolt only with locking paint.

Idle-compensation solenoid-operated valve

If the idle speed drops below a predetermined value (e.g. due to loading by alternator), the solenoid-operated valve opens (energized by EZ-K control unit) and opens the air bypass. The engine speed is raised by approx. 100 min^{-1} by the air which then bypasses the throttle valve.
Idle compensation operates at 750 ... 950 min^{-1}.

9. Troubleshooting

9.1 Using the self-diagnosis system and the self-diagnosis test chart

This vehicle is equipped with an EZ-K control unit which has a self-diagnosis feature (knock control only).
Therefore every test conducted with the engine running must begin with the self-diagnosis system.
Coordinates B5/B6 describe how to activate the system.
The self-diagnosis test chart which begins at coordinates B7/B8 identifies trouble indicators (in the form of voltage pulses), causes of trouble and test procedures, and gives the coordinates for more specific troubleshooting.
If the self-diagnosis system indicates no trouble but the cause of the customer's complaint has not been eliminated, continue the troubleshooting procedure in accordance with the trouble-shooting chart and the troubleshooting sequence beginning at coordinate B 9.

9.2 Using the troubleshooting chart

The troubleshooting chart beginning at coordinate B9 lists customer complaints (symptoms), causes of trouble, test procedures and reference coordinates.
Select the possible cause of the trouble which corresponds to the customer's complaint as indicated in the troubleshooting chart.

If the cause of the trouble is unclear, begin testing using the extensive, self-contained troubleshooting sequence beginning at coordinate B 15.

If the cause of the trouble can be clearly determined according to the troubleshooting chart, the problem can be pinpointed using the given coordinates without having to go through the entire troubleshooting sequence for each problem.
If no coordinates are given, proceed with troubleshooting using the "test steps" column.

9.3 Using the trouble-shooting program

The troubleshooting program beginning at coordinate B 15 is divided into 3 columns:

The left-hand column gives test steps and test values.

The center column gives instructions for repair.

The right-hand column contains the corresponding figures and wiring diagrams and indicates their locations.

If the questions given in the left-hand column can be answered "yes", go on to the next test directly below.

If a question is answered "no", move over to the center column and conduct the tests listed there.

9.4 Testing requirements

Battery fully charged, fuel system OK, engine in good working order (compression, valve clearance, etc.), ambient temperature or temperature of ignition system between 0 and 100°C (temperature has pronounced effect on measurements).

9.5 Activating the self-diagnosis

Conditions for testing: Engine at normal operating temperature/operating at > 4500 min^{-1}

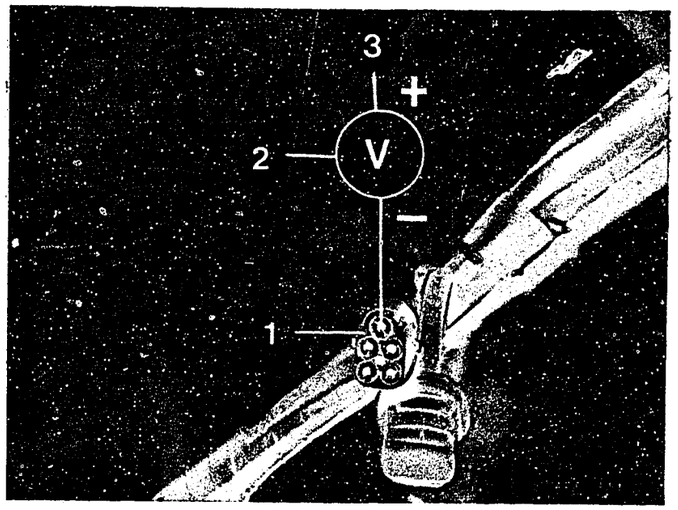
General

The EZ-K control unit has a self-diagnosis feature with diagnostic connection in the engine compartment. See top picture.
With this self-diagnosis, only 1 fault is indicated in all cases.
To have further faults indicated, the first detected fault must be remedied.
A total of 4 different faults can be detected in the form of voltage pulses via the diagnostic connection.
The voltage pulses are measured with an ANALOG VOLTMETER (pointer instrument) and are evaluated in the form of pointer deflections.
The operator therefore counts the voltage pulses (pointer deflections on voltmeter).

It is not possible to use voltmeters with a digital display.

Activation

Disconnect vacuum hose from EZ-K control unit on intake manifold. See arrow in bottom picture.
Connect voltmeter to battery positive and diagnostic connection. See top picture.
Switch on ignition.
The voltmeter must indicate approx. battery voltage. If battery voltage is not indicated, perform test step on Coordinates C1/C2. Then continue activation as per Coordinates B5/B6. Start engine and operate briefly at > 4500 min^{-1} and then at idle. Depending on the fault, the voltmeter now indicates 2 to 5 voltage pulses which are evaluated and remedied with the aid of the self-diagnosis test table (Coordinates B7/B8).
Note: There is a pause after each pass through the diagnosis sequence (voltmeter remains in "zero position").
Repeat pass through diagnosis sequence including pauses until the igntion is switched off. The fault stored in the EZ-K control unit is now also deleted.
Activation of self-diagnosis with subsequent remedying of fault must be repeated until there are no more voltage pulses shown. (Knock control is then OK).



1 = Diagnostic connection
2 = Analog voltmeter
3 = Battery positive connection

Self-diagnosis test table

Fault indication	Cause of fault	Test instructions	Coordinates
No voltage pulses	Knock control O.K.	-----	----
1 Voltage pulse not occupied.	-----	-----	----
2 Voltage pulses	Coolant-temperature sensor not O.K.	-----	C 9
3 Voltage pulses	Intake-air temperature sensor not O.K.	-----	C 11
4 Voltage pulses	Knock control not O.K.	Check knock sensor (mounting of knock sensor, open circuit in lead or short circuit), or EZ-K control unit defective.	C 13
5 Voltage pulses	EZ-K control unit (load sensor) not O.K.	Replace EZ-K control unit	----

9.6 Troubleshooting chart

Customer complaint (symptom)

1. Starter engages, engine does not start	2. Rough/unsteady idling	3. Engine gets no gas (flow problem)	4. Poor engine performance	5. Engine misfires	6. Fuel consumption too high	7. Engine pings or knocks	8. Faulty ignition	9. Engine runs too hot	Cause of trouble	Test steps	Coordinates
●	●	●	●	●	●	●	●	●	Unclear	Perform thorough troubleshooting	B 15
●	●	●	●	●	●		●		Spark plugs defective	Evaluate ignition oscilloscope trace or remove and visually check spark plug	----
		●	●	●	●				Suppression resistors defective	Evaluate oscilloscope trace or measure resistance	----
●	●	●	●	●					Shunt on secondary side	Check ignition coil, ignition distributor, ignition-harness and spark plug by means of oscilloscope trace or visual check	----
●	●	●	●	●					Open circuit on secondary side	Check ignition coil, ignition distributor, ignition harness and spark plug by means of oscilloscope trace or check continuity using ohmmeter	----
●									Open circuit on primary side	---	E 1
●	●	●	●	●					Ignition coil defective	---	B 17

Trouble-shooting chart (continued)

Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start	2. Rough/unsteady idling	3. Poor throttle take-up (flat spot on acceleration)	4. Insufficient engine power	5. Engine missing	6. Fuel consumption too high	7. Engine knocking/pinging	8. Backfiring	9. Engine overheating	Cause of fault	Test instructions	Coordinates
●	●						●		Firing sequence incorrect	Firing sequence 1 - 3 - 4 - 2	---
●									Contact resistance of trigger box/EZ-K control unit incorrect	---	B 19...B 23
						●			Microswitch - idle contact defective	---	C 3
		●	●	●	●	●		●	Basic ignition timing incorrect	To prevent incorrect setting, be sure to test as described on coordinates given on right.	C 3...C 5
	●								Idle-compensation solenoid-operated valve defective	---	C 7
			●		●				Coolant-temperature sensor defective	---	C 9
			●		●				Intake-air temperature sensor defective	---	C 11

Trouble-shooting chart (continued)

Customer complaint (fault symptom)

1. Starting motor operates, engine fails to start	2. Rough/unsteady idling	3. Poor throttle take-up (flat spot on acceleration)	4. Insufficient engine power	5. Engine missing	6. Fuel consumption too high	7. Engine knocking/pinging	8. Backfiring	9. Engine overheating	Cause of fault	Test instructions	Coordinates
			●		●				Knock sensor or EZ-K control unit defective	---	C 13
		●	●		●	●			Vacuum sensor of EZ-K control unit defective	---	C 19...C 21
				●					Trigger box defective	---	D 1
●									Trigger box power supply defective	---	E 1
●									EZ-K control unit power supply defective	---	E 3
●									Ignition pulse generator defective	---	E 5...E 11
●									EZ-K control unit defective	---	E 13
			●		●				Abnormal engine noises	Engine not mechanically O.K. (bearing damage, valve spring broken etc)	----
			●		●	●			Fuel not O.K.	Fuel with too low octane number	----

9.7 Trouble-shooting program

Check primary signal.

If oscilloscope or tachometer tester not available, check for ignition spark on spark discharge tester.

Primary signal with oscilloscope

Connect oscilloscope to ignition coil as per operating instructions (use adapter for ignition coil). Start engine; oscilloscope must show a primary voltage (any voltage).

Primary signal with tachometer tester

Connect tachometer to ignition coil as per operating instructions (use adapter for ignition coil). Start engine. Tachometer must show a reading (of any value).

Ignition spark with spark discharge tester

Remove high tension ignition cable at terminal 4 of ignition coil.
Connect spark discharge tester with sleeve-type suppressor (5 kΩ) to ignition coil.
Set spark gap to 5 mm.
Start engine.
Sparks must appear across spark gap.

Are primary signal and/or ignition sparks in spark gap present?

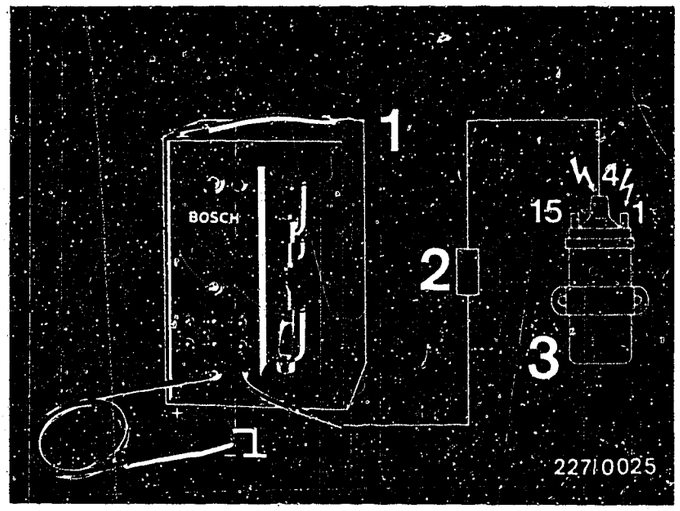
no →

If no primary signal or ignition spark is present, continue test at coordinate E 1.

Test beginning at B 17 not necessary.

yes ↓

Continued on B 17/B 18



1 = Spark discharge tester
2 = 5 kΩ sleeve-type suppressor
3 = Ignition coil

Danger arrows: Warning: 400 V...25 kV

yes

Check distributor cap, distributor rotor, high tension ignition cables and spark plugs.

Is high voltage side OK?

no → Repair high voltage side.

yes

Check ignition coil.

Visual check:

Remove protective cap from ignition coil and check for presence of plug and any leakage of sealing compound.

Electrical check:

Ignition coil, primary (term. 15 and term. 1) 0,6...1,1 Ω (take resistance of test lead/test prods into account).

Ignition coil, secondary (term. 1 and term. 4) 6,4 ... 11,1 kΩ

Plug present and no sealing compound leakage?

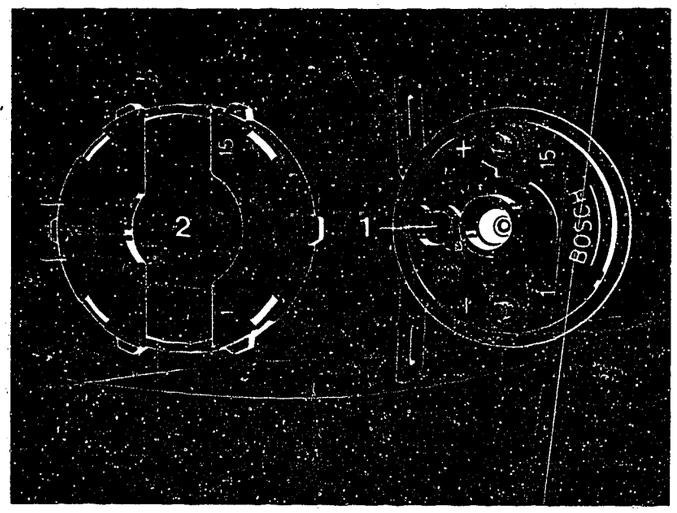
Is resistance value OK?

no →

1. If the plug is missing and sealing compound has leaked, replace control unit, anti-knock control unit and ignition coil.
2. If resistance values not OK, replace ignition coil.

yes

Continued on B 19/B 20



1 = Plug
2 = Protective cap

yes

Engine running? — no

yes

Test step 1

Remove cap and dust-protection cover from ignition distributor.

Set cylinder 1 to TDC. Mark 0 = TDC, see top picture.

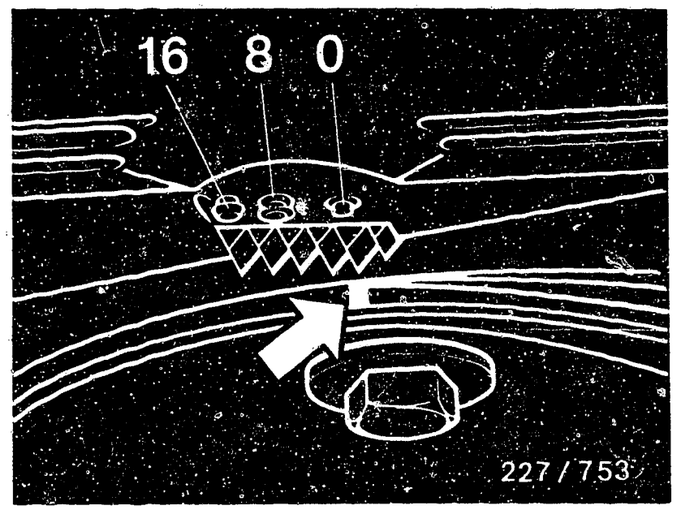
The distributor rotor must be positioned such that the center of the distributor-rotor electrode is pointing toward the cylinder 1 mark on the housing. See center picture.

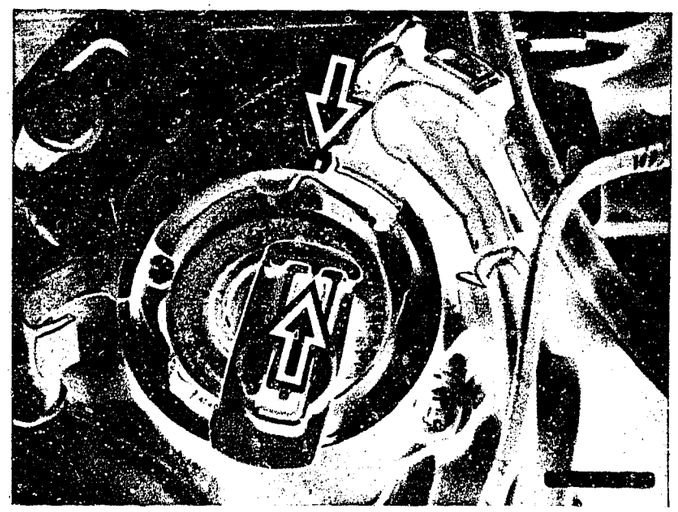
Adjust ignition distributor.

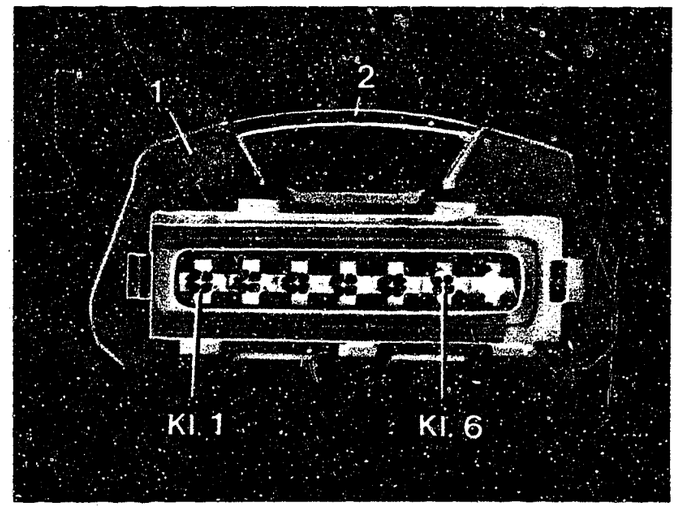
Test step 2

Disconnect negative and positive cables from battery.
Disconnect trigger-box plug (1) after pressing wire retainer (2); see bottom picture.
Switch on ignition.

Check for contact resistance in leads from positive battery terminal to trigger-box plug term. 4 including leads from negative battery terminal to trigger-box plug term. 2. Total contact resistance max. 0.3 Ω (take resistance of test lead/test prods into account).
Eliminate contact resistance.







Continued on C 1/C 2

Continued on B 21/B 22

Continued

Check for contact resistance in leads from positive battery terminal to ignition coil term. 15 and in lead from ignition coil term. 1 to trigger-box plug term. 1. Total contact resistance max. 0.3 Ω (take resistance of test lead and test prods into account). Eliminate contact resistance.

Test step 3

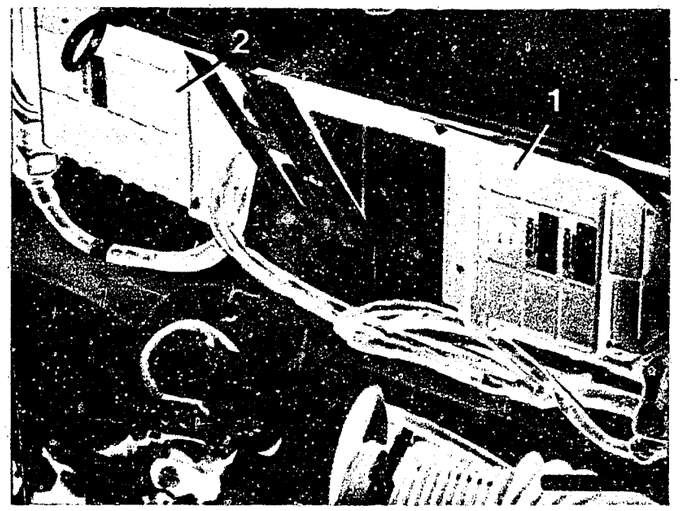
Connect battery. Connect dwell-angle tester to ignition coil as per operating instructions (use adapter for ignition coil). Start engine. Dwell-angle tester must indicate 27 ... 33% (only during cranking phase). If dwell angle not O.K., replace EZ-K control unit.

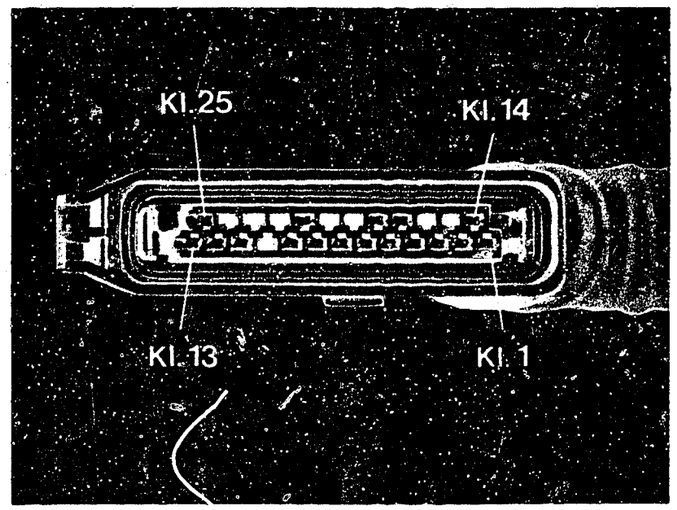
yes

Test step 4

Disconnect KE-Jetronic control-unit plug. See top picture Item 2.

Connect oscilloscope as per operating instructions with program switch in "special" position.





Continued on C 1/C 2

Continued on B 23/B 24

Continued

For example, MOT 201:
Connect red clamp to KE-Jetronic control-unit plug term. 25 (measured signal). See bottom picture.

Black clamp to vehicle ground.

Start engine.

Oscilloscope must show rectangular pulse (signal present). See center diagram.

yes

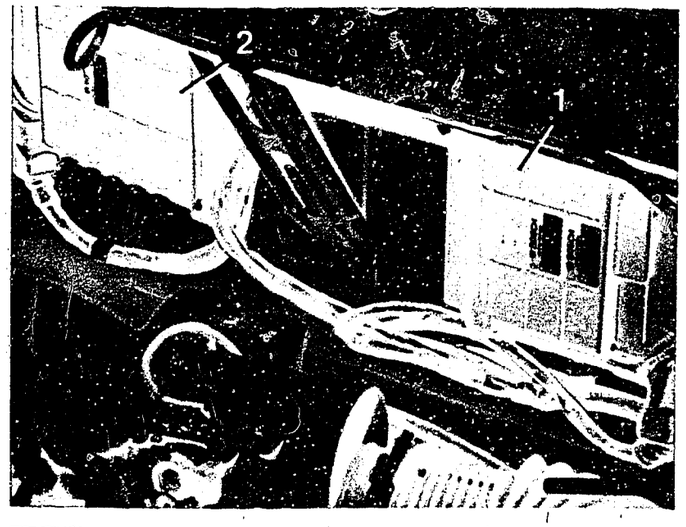
If rectangular pulse not present, disconnect EZ-K control-unit plug. See top picture Item 1.

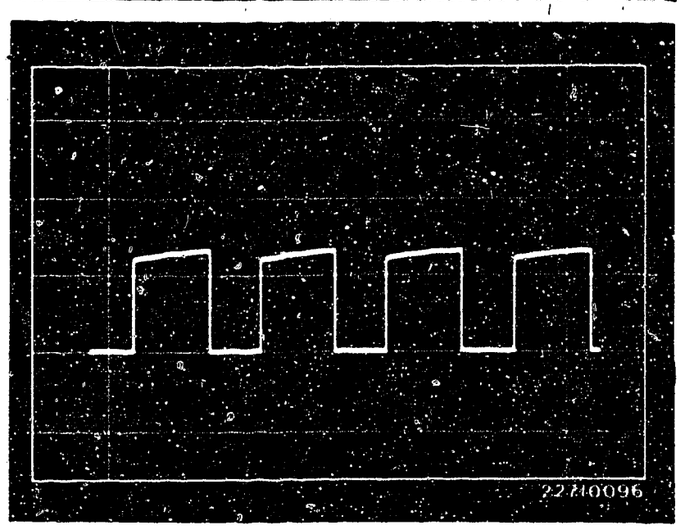
Check for open circuit in lead from EZ-K control-unit plug term. 17 to KE-Jetronic control-unit plug term. 25.
Eliminate open circuit.
Note: Layout term. 1 ... 25 identical on both plugs. See bottom picture.

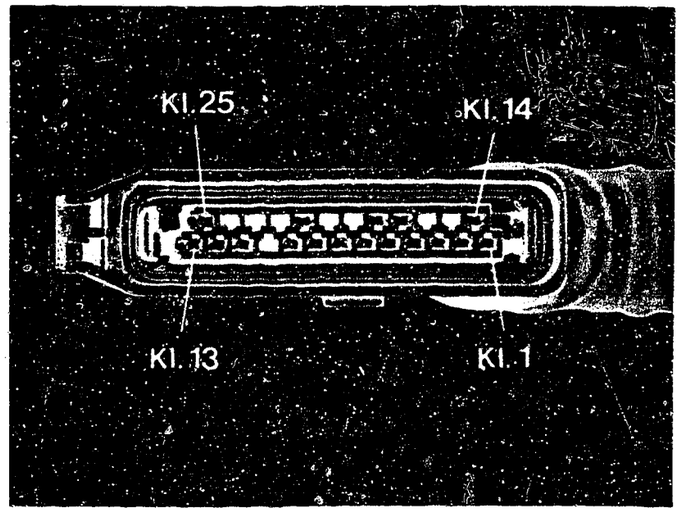
If no open circuit, replace EZ-K control unit.

Test step 5
If test steps 1, 2, 3, 4 were O.K., try installing specified ignition coil.
If engine still not running, re-install "old" ignition coil and replace trigger box.

Continued on C 1/C 2







yes

Check diagnostic connector

1. Connect analog voltmeter to positive battery terminal and diagnostic connector. See top photograph. Switch on ignition (do not start engine). Voltmeter must indicate approximate battery voltage.

2. Start engine and briefly run up to >4500 min^{-1}. Then run at idle. Voltmeter must now indicate approx. 0 V or may show voltage pulses.

Is voltage under 1 and 2 above OK?

no

1. If, in point 1, battery voltage is not indicated, disconnect EZ-K control-unit plug. (Bottom picture) and check for open circuit in lead from EZ-K control-unit plug term. 3 to diagnostic connection.

Eliminate open circuit.

If there was no open circuit, replace EZ-K control unit.

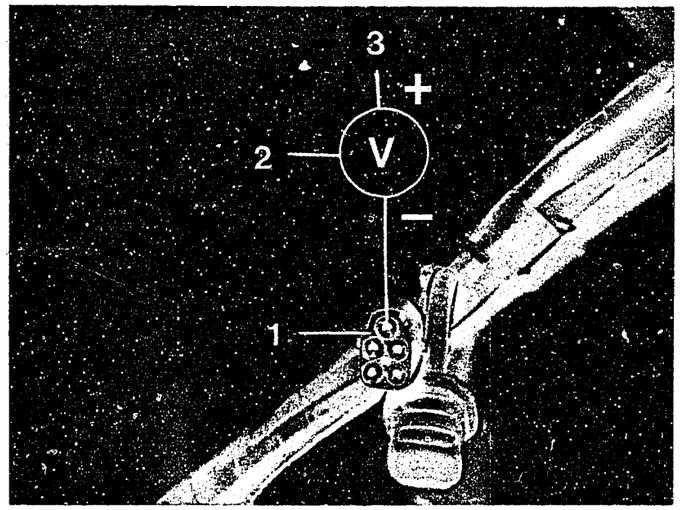
2. If, in point 2, battery voltage is continuously indicated, check for short circuit to ground in lead from EZ-K control-unit plug term. 3 to diagnostic connection.

Eliminate short circuit to ground.

If there was no short circuit to ground, replace EZ-K control unit.

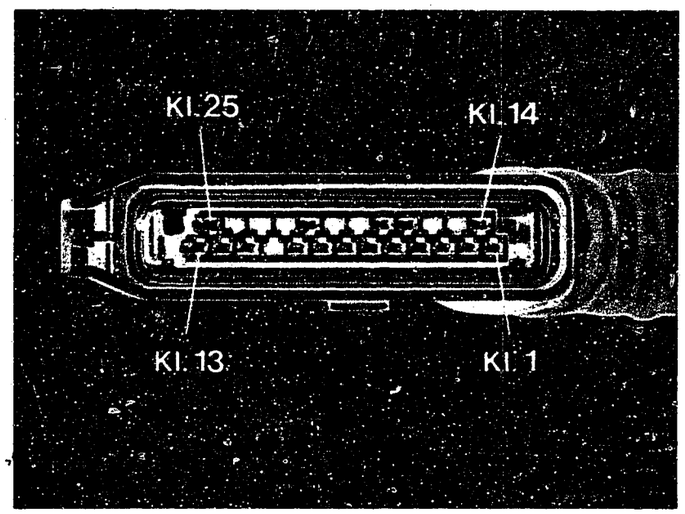
yes

Continued on C 3/C 4



1 = Diagnostic connector
2 = Analog voltmeter
3 = Positive battery terminal

EZ-K control-unit plug



yes

Check microswitch - idle contact.

1. Switch off ignition.
Disconnect EZ-K control-unit plug and connect ohmmeter to term. 7 and vehicle ground.
See top picture.
Throttle valve closed.
Ohmmeter must indicate approx. 0 Ω (continuity).
2. Open throttle valve approx. 2°.
Ohmmeter must indicate ∞Ω.
Resistance value O.K.?

no →

Take apart plug connector (idle/full-load contact) after pressing the wire retainer. See arrow in center picture. Connect ohmmeter one after the other to:

Plug connector (bottom picture Item 1)	EZ-K control unit plug (top picture)
Term. 7	and Term. 7
Term. 31	and vehicle ground

Ohmmeter must indicate approx. 0 Ω (continuity).

If resistance ∞Ω, eliminate open circuit.

Connect ohmmeter to plug connector (bottom picture Item 2) term. 7 and term. 31.

Throttle valve closed.
Ohmmeter must indicate approx. 0 Ω (continuity).

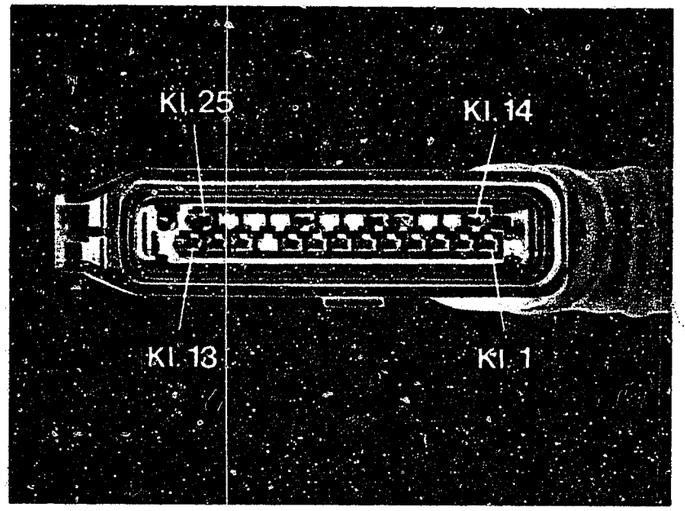
If resistance ∞Ω, replace microswitch.

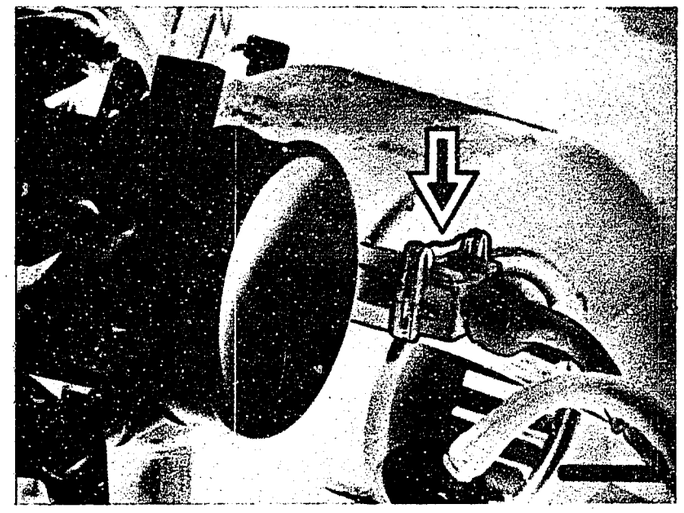
Open throttle valve approx. 2°.
Ohmmeter must indicate approx. ∞Ω.

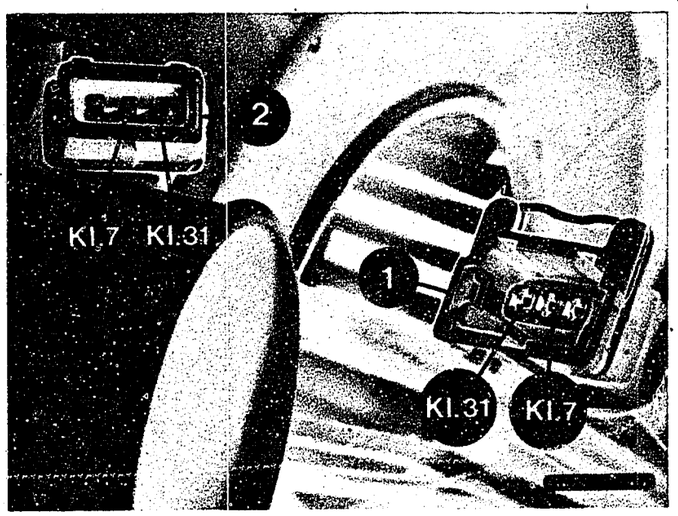
If resistance 0 Ω, replace microswitch.

yes

Continued on C 5/C 6







yes

Check basic ignition timing.
Engine at normal operating temperature
(> +60°C coolant temperature).
Operate engine at 900 ± 25 min^{-1}.

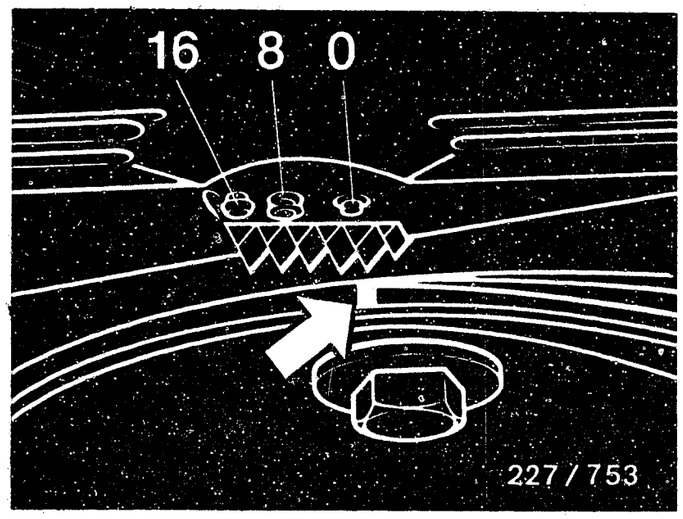
Caution.
Microswitch (idle contact) must be closed.
(In case of clearly incorrect indication of engine speed on testers, connect in series resistor or convert motortester.)

Flash timing light at ignition-timing mark.
See picture.

Basic ignition timing must be 12 ± 1° BTDC.

Basic ignition timing O.K.?

no → Loosen ignition-distributor mounting and turn ignition distributor until 12 ± 1° BTDC is obtained.



Ignition-timing mark

yes

Continued on C 7/C 8

yes

Check idle-compensation solenoid-operated valve.

1. Switch off ignition.
Take apart plug connector of solenoid-operated valve (arrow, top picture) and connect voltmeter (+) to plug connector (top picture, Item 1) and vehicle ground. Switch on ignition.
Voltmeter must indicate approx. battery voltage.
2. Operate engine at > 1000 min^{-1}.
Voltmeter must indicate 0 V.
3. Switch on electric loads (lights, heated rear window etc.).
Operate engine at idle, make note of idle speed. Connect plug connector (top picture, Item 2) to battery positive. Idle speed must increase slightly (approx. 100 min^{-1}).

Test steps 1, 2 and 3 O.K.?

yes

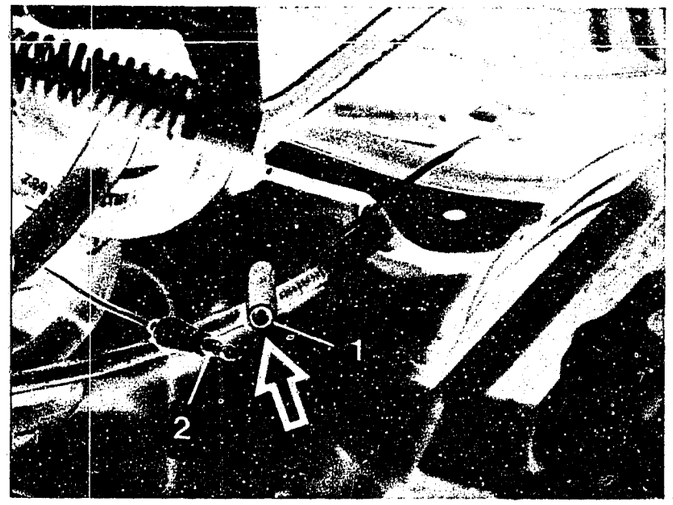
Continued on C 9/C 10

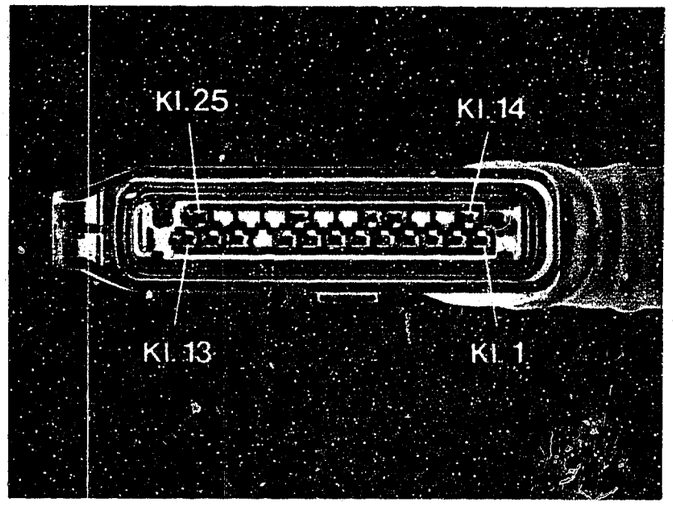
no

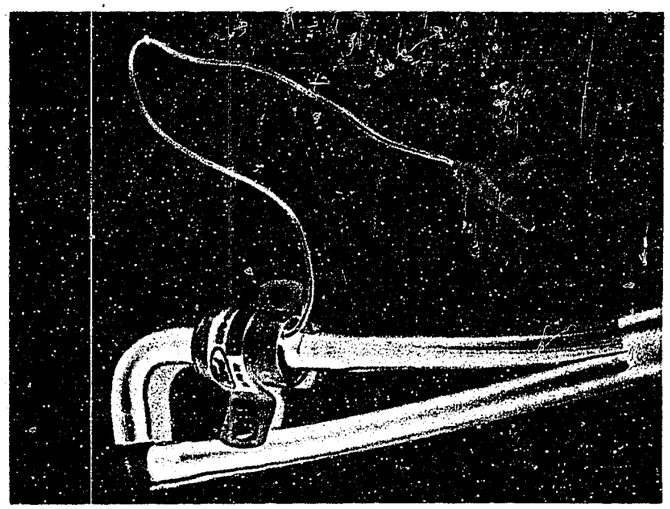
Test step 1 not O.K.
Check for open circuit in lead from plug connector (top picture, item 1) to EZ-K control-unit plug (center picture) term. 2.
Eliminate open circuit. If there was no open circuit, replace EZ-K control unit.

Test step 2 not O.K.
Check for positive connection in lead from plug connector (top picture, Item 1) to EZ-K control-unit plug (center picture) term. 2.
Eliminate positive connection. If there was no positive connection, replace EZ-K control unit.

Test step 3 not O.K.
Connect ohmmeter to plug connector (top picture, Item 2) and vehicle ground.
Resistance 24 ... 40 Ω. If resistance not O.K., replace solenoid-operated valve. Check hose connection between throttle-valve assembly and solenoid-operated valve for leaks. See bottom picture.







yes

Check coolant-temperature sensor
(open circuit/short circuit to ground).
There is no open circuit/short circuit to ground in the coolant-temperature sensor if, during the SELF-DIAGNOSIS, the voltmeter did not indicate 2 voltage pulses.

Self-diagnosis O.K.?

no → Check for open circuit in lead from coolant-temperature sensor plug term. 25 (top picture) to EZ-K control-unit plug term. 25 (bottom picture). Eliminate open circuit.

yes

Check coolant-temperature sensor (resistance).
Coolant-temperature sensor plug connected.
Switch off ignition.
Disconnect EZ-K control-unit plug and connect ohmmeter to term. 20 and term. 25. See bottom picture.
See table for resistance values.

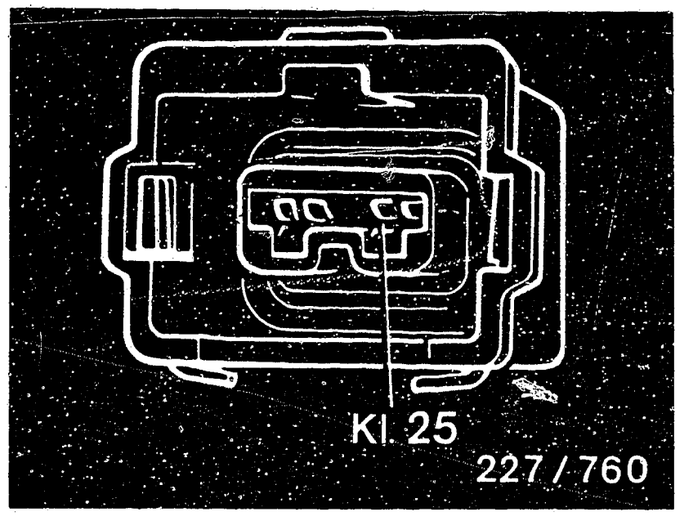
Coolant temperature	Resistance values
+20°C	2.1 ... 3.0 kΩ
+30°C	1.4 ... 2.0 kΩ
+80°C	280 ... 380 Ω
+90°C	210 ... 280 Ω
+100°C	160 ... 220 Ω

Resistance values O.K.?

no → Replace coolant-temperature sensor.

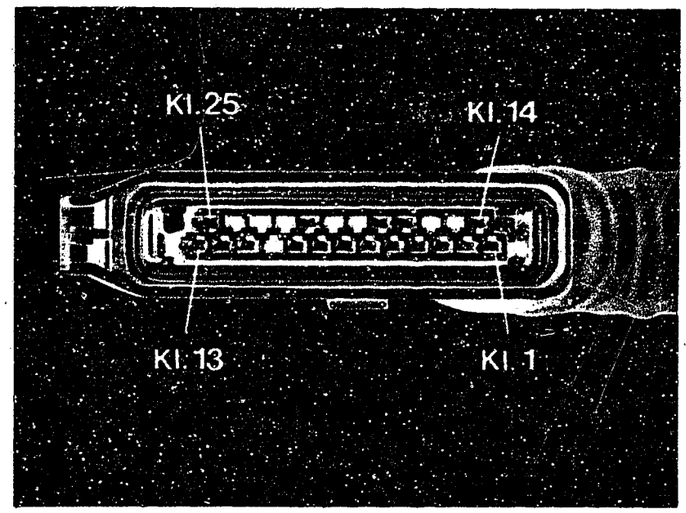
yes

Continued on C 11/C 12



Coolant-temperature sensor plug

EZ-K control-unit plug



yes

Check intake-air temperature sensor (open circuit/short circuit to ground).
There is no open circuit/short circuit to ground in the intake-air temperature sensor if, during the SELF-DIAGNOSIS, the voltmeter did not indicate 3 voltage pulses.
Self-diagnosis O.K.?

no → Check for open circuit in leads from intake-air temperature sensor plug term. 9 and term. 11 (top picture) to EZ-K control-unit plug term. 9 and term. 11 (bottom picture). Eliminate open circuit.

yes

Check intake-air temperature sensor (resistance).
Intake-air temperature sensor plug connected.
Switch off ignition.
Disconnect EZ-K control-unit plug and connect ohmmeter to term. 9 and term. 11. See bottom picture.
See table for resistance values.

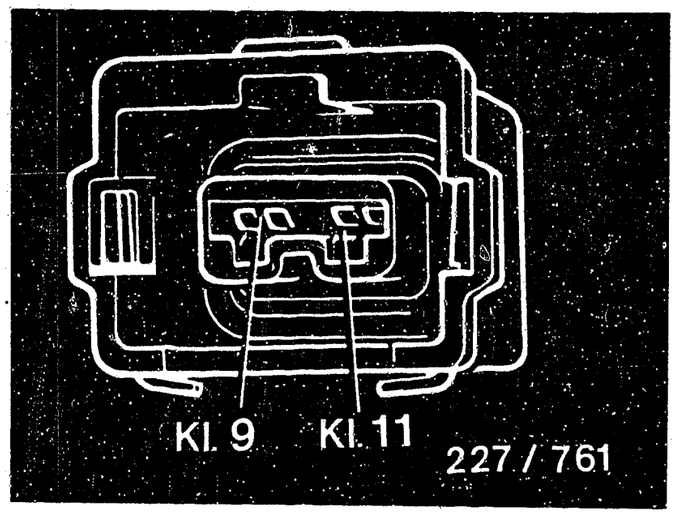
Intake-air temperature	Resistance values
+10°C	0.92 ... 0.99 kΩ
+20°C	0.97 ... 1.04 kΩ
+30°C	1.02 ... 1.09 kΩ
+40°C	1.06 ... 1.14 kΩ
+50°C	1.11 ... 1.19 kΩ

Resistance values O.K.?

no → Replace intake-air temperature sensor.

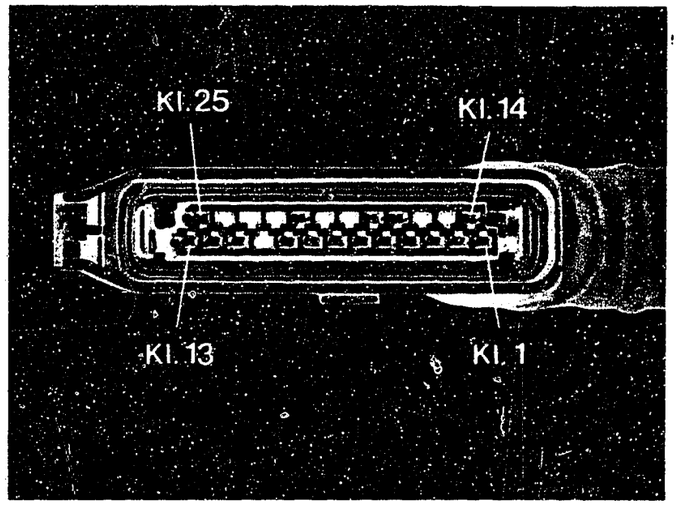
yes

Continued on C 13/C 14



Intake-air temperature sensor plug

EZ-K control-unit plug



yes

Check knock sensor.

The knock sensor is OK if the

SELF-DIAGNOSIS SYSTEM

has not indicated 4 voltage pulses on the voltmeter.

Is self-diagnosis system OK?

no

1. Visual check:
Disconnect knock-sensor plug.
See top picture.

Check male and female contacts of knock sensor connector for oxidation.

Remove oxidation. See bottom picture.

Reconnect knock sensor connector.

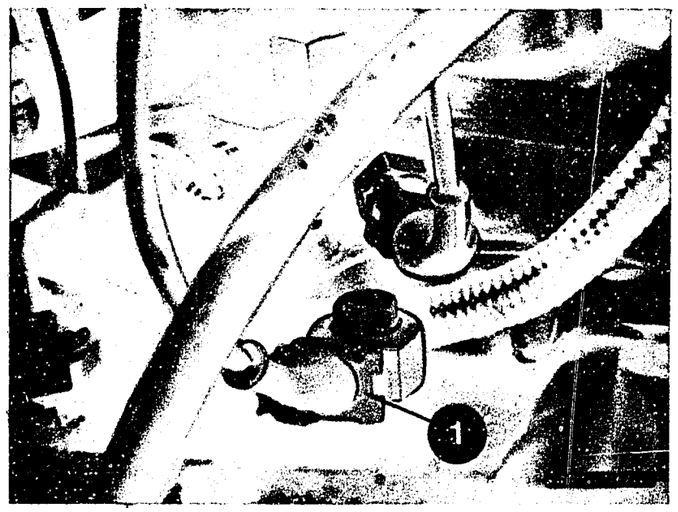
Activate self-diagnosis system.

If self-diagnosis system is still not working correctly, follow steps 2 through 5 below.

yes

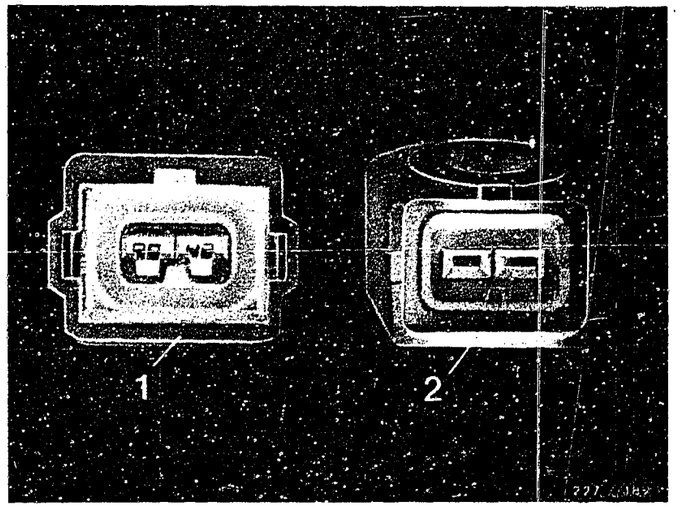
Continued on C 19/C 20

Continued on C 15/C 16



1 = Knock sensor

1 = Knock sensor plug
2 = Knock sensor socket



Continued

Switch off ignition.
Disconnect knock sensor plug and EZ-K control-unit plug.

2. Connect ohmmeter to:

Knock sensor plug		EZ-K control-unit plug
Term. 12	and	term. 12
Term. 13	and	term. 13

Ohmmeter must indicate approx 0Ω (continuity).
Eliminate open circuit.

3. Connect ohmmeter to:

Knock sensor plug		EZ-K control-unit plug
Term. 13	and	term. 20

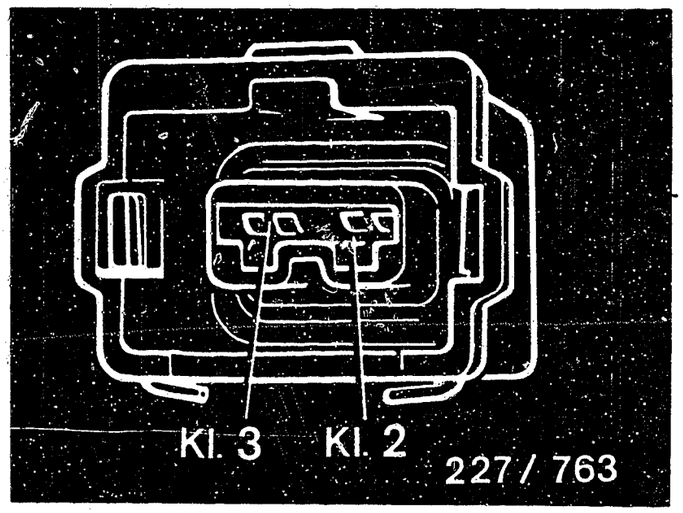
Ohmmeter must indicate ∞Ω. If ohmmeter indicates approx 0 Ω (continuity), eliminate short circuit to ground between knock sensor lead term. 13 and term. 20.

4. Connect knock sensor plug. Connect ohmmeter to:

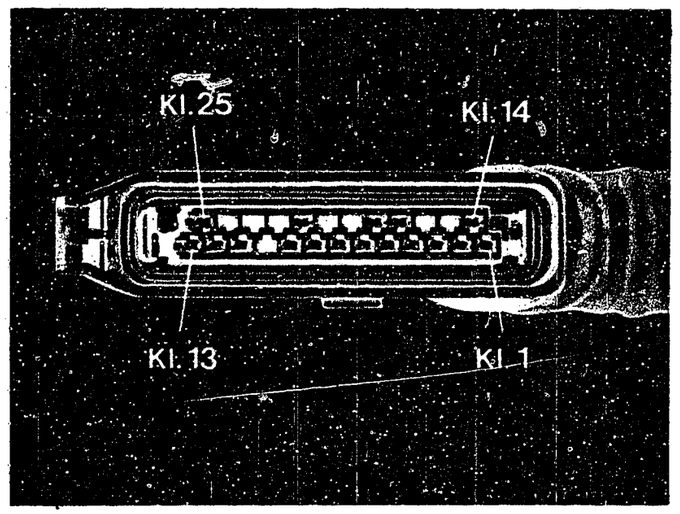
EZ-K control-unit plug		EZ-K control-unit plug
Term. 12	and	term. 13

Ohmmeter must indicate 270...330 kΩ
If resistance value not correct, replace knock sensor.

yes



Knock sensor plug



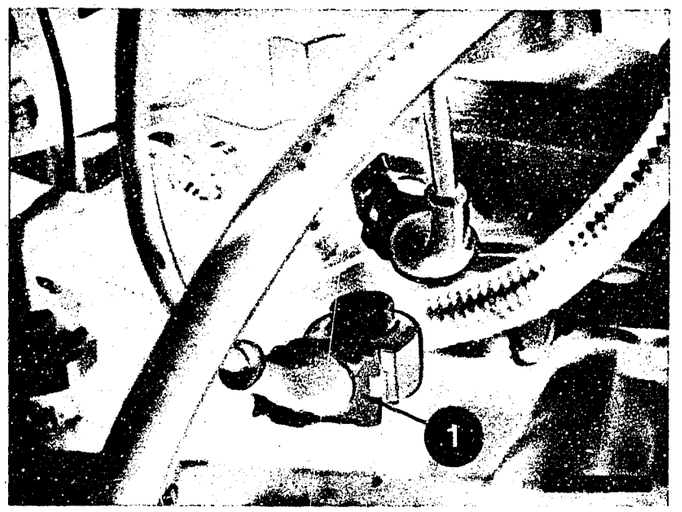
EZ-K control-unit plug

Continued on C 19/C 20

Continued on C 17/C 18

Continued

5. Check tightening torque 11 ... 15 Nm of knock sensor fastening screw.
If points 1 ... 5 O.K., replace knock sensor.
Re-activate self-diagnosis. If self-diagnosis still indicates 4 voltage pulses, re-install "old" knock sensor and replace EZ-K control unit.



1 = Knock sensor

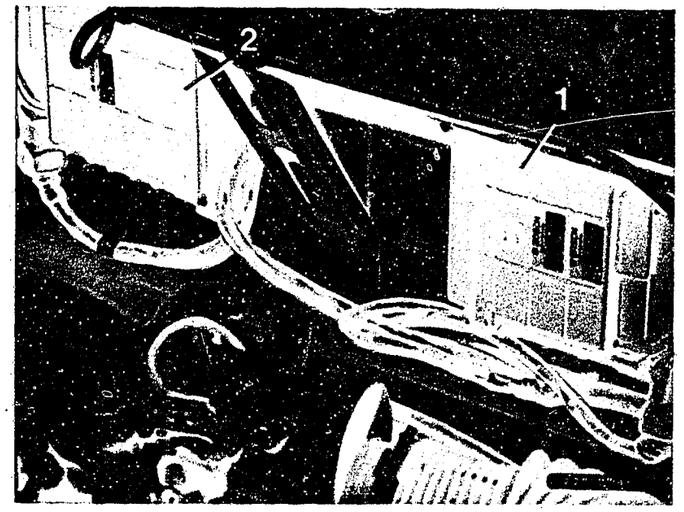
yes

Continued on C 19/C 20

yes

Check vacuum sensor (electrically).
The vacuum sensor is electrically O.K. if, during the SELF-DIAGNOSIS, the voltmeter did not indicate 5 voltage pulses.
Self-diagnosis O.K.?

no → Replace EZ-K control unit.



1 = EZ-K control unit
2 = KE-Jetronic control unit

yes

Continued on C 21/C 22

yes

Check vacuum sensor (vacuum operation).
Disconnect vacuum hose (1) from intake manifold (2). See top picture. Connect vacuum pump (3) to disconnected vacuum hose. See top picture.
Take apart microswitch plug connector (idle/full-load contact). See arrow, center picture.
Operate engine at idle. Hand adjuster (delay) on ignition-timing light off.

Using vacuum pump, build up approx. 500 mbar. Ignition timing must shift in "ADVANCE" direction. Idle speed increases.
Ignition timing "ADVANCED"?

no → Check vacuum hose (1) between intake manifold (2) and EZ-K control unit for leaks.
Eliminate leaks.
If there were no leaks, replace EZ-K control unit.

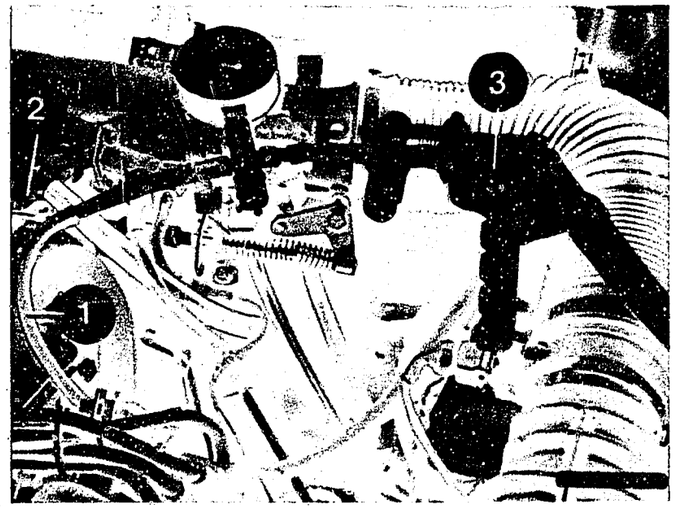
yes

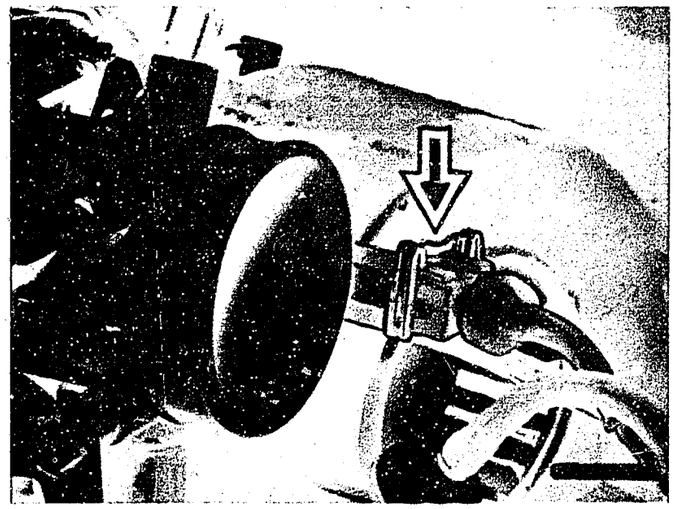
Connect microswitch plug connector. See center picture.

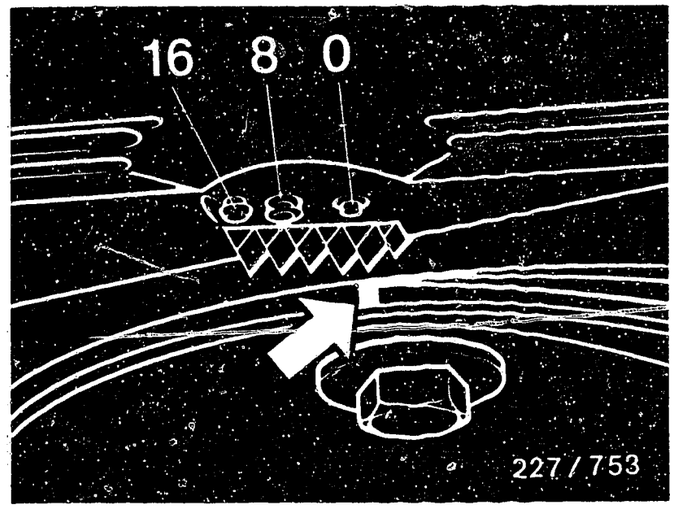
Connect vacuum hose (1). See top picture.

yes

Continued on C 23/C 24







yes

Check trigger box power supply.

Remove trigger box with heat sink. Push back rubber sleeve on trigger-box plug. Connect voltmeter with test prods to trigger-box plug term. 4 (+) and term. 2 (-). See top picture.
Operate engine at idle.
Measured voltage must be 12 ... 14 V and may be no more than 1 V below battery voltage.

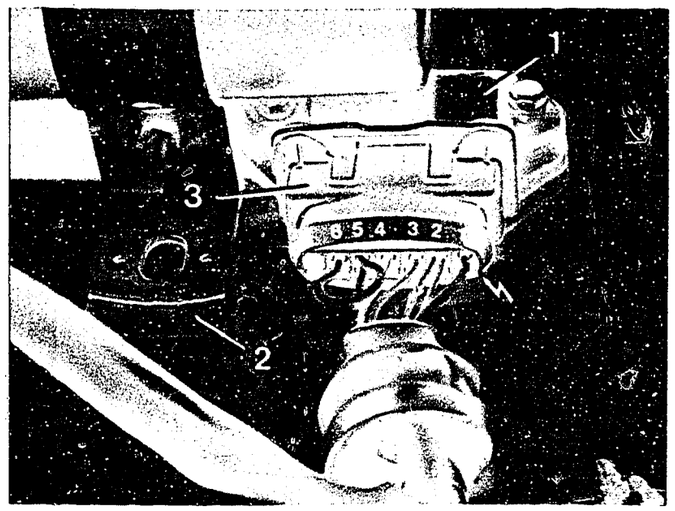
Voltage correct?

no →

Disconnect negative and positive cables from battery. Disconnect trigger-box plug after pressing wire retainer. Switch on ignition.

Check for contact resistance in leads from positive battery terminal to trigger-box plug term. 4 including leads between negative battery terminal and trigger-box plug term. 2. Total contact resistance max. 0.3 Ω (take resistance of test lead and test prods into account).

Eliminate contact resistance.



1 = Trigger box
2 = Heat sink
3 = Trigger-box plug

yes

Check ignition coil power supply.

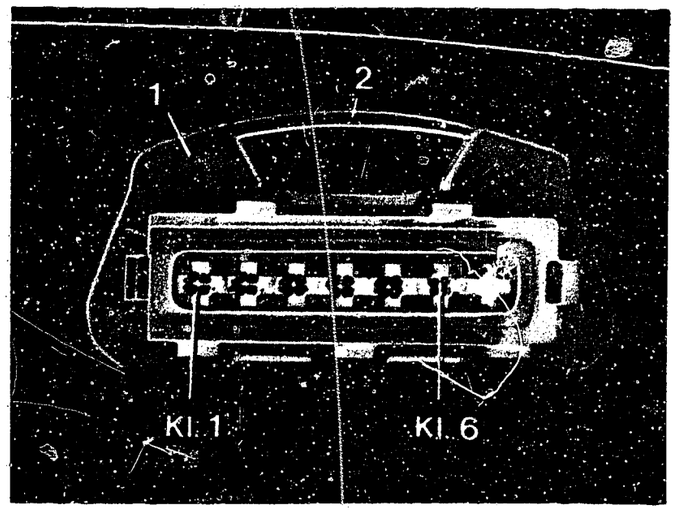
Connect voltmeter to ignition coil term. 15 (use adapter for ignition coil) and battery negative terminal. Operate engine at idle.
Measured voltage must be 10 V.
Voltage correct?

no →

Disconnect positive cable from battery. Switch on ignition.
Check for contact resistance in leads between positive battery terminal and ignition coil term. 15.
Contact resistance max. 0.3 Ω.
(Take resistance of test lead and test prods into account.)

Eliminate contact resistance.

1 = Trigger-box plug
2 = Wire retainer



yes

Continued on D 1/D 2

yes

Check primary voltage.

(if MOT series oscilloscope available)

Connect oscilloscope (e.g. MOT 201) to ignition coil as per operating instructions with adapter for ignition coil including pulse shaper 1 684 463 154.

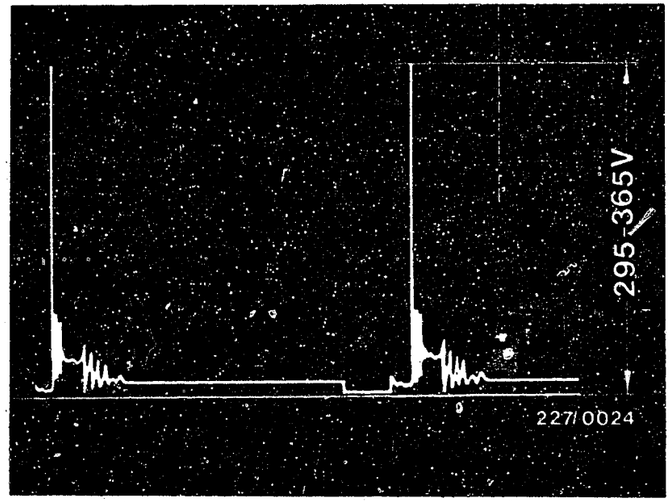
Note: Incorrect measured value without pulse shaper.

Run engine ad idle.

The primary voltage must be 295 ... 365 V (see illustration).

Is voltage value OK?

no → Replace control unit.



yes

If all test steps O.K. and customer complaint still not remedied, try installing specified ignition coil.
If customer complaint still not remedied, re-install "old" ignition coil.
Igition system O.K.
Testing completed.
Testing starting on Coordinate E1 not necessary.

Note:
Further possible faults on fuel system, or engine not mechanically O.K.

No primary signal or no ignition spark

(continued from B 15/B 16)

yes

Check voltage from control unit.
Switch off ignition.
Pressing wire retainer.
Unplug control unit connector.
Connect positive lead of voltmeter to terminal 4 and negative lead to terminal 2 of control unit connector.
Switch on ignition.
Voltmeter must indicate battery voltage. Voltage O.K.?

no → Check leads and connections between ignition/starter switch and control unit connector terminal 4 and ground lead terminal 2 for discontinuity.
Eliminate discontinuity.

yes

Check primary circuit.

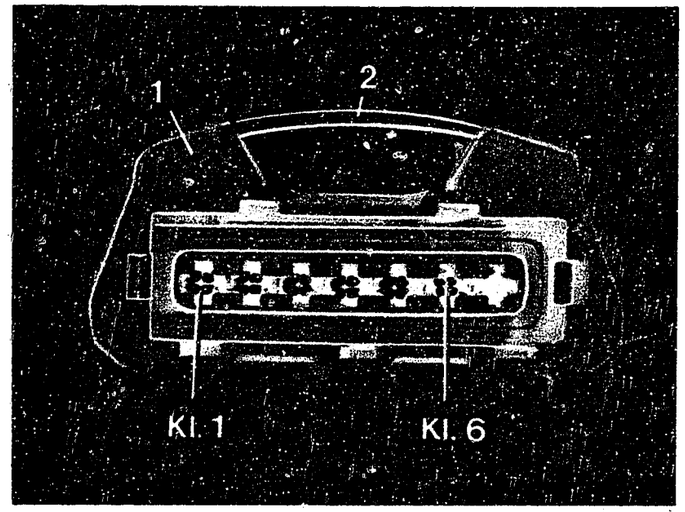
Connect positive lead of voltmeter to terminal 1 and negative lead to terminal 2 of unplugged control unit connector.
Switch on ignition.
Voltmeter must indicate battery voltage.

Is voltage value OK?

no → Check lead from ignition/starter switch to ignition coil terminal 15, the primary winding of the ignition coil, and the lead from ignition coil terminal 1 to control unit connector terminal 1 and ground lead terminal 2 for continuity.
Eliminate discontinuity.

yes

Continued on E 3/E 4



1 = Trigger-box plug
2 = Wire retainer

yes

Check EZ-K control unit power supply.

Switch off ignition.

Disconnect EZ-K control-unit plug.

Connect voltmeter to EZ-K control-unit plug term. 6 (+) and term. 20 (-).

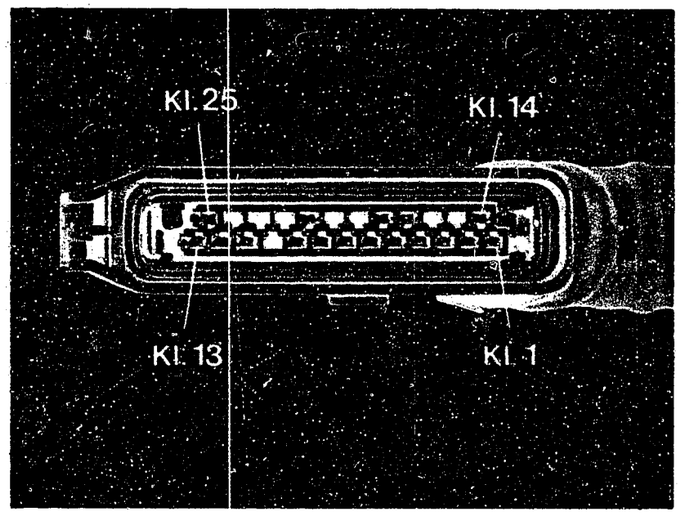
Switch on ignition.

Voltmeter must indicate battery voltage.

Is voltage OK?

no → Check for open circuit in lead from ignition/starting switch to EZ-K control-unit plug term. 6 including ground lead term. 20.

Eliminate discontinuity.



EZ-K control-unit plug

yes

Continued on E 5/E 6

yes

Check male and female halves of ignition distributor connector.

Disconnect ignition-distributor plug after pressing the wire retainer (see arrow, top picture)

Visual check:

Check male and female contacts of ignition distributor connector for oxidation. See bottom picture.

Remove oxidation.

Reconnect ignition distributor connector.

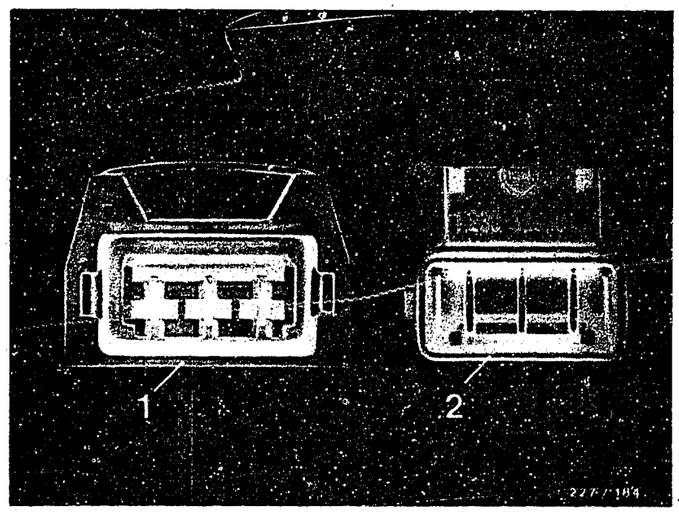
Start engine.

If no primary signal or ignition spark, continue test.

yes

Continued on E 7/E 8

1 = Male ignition distributor connector
2 = Female ignition distributor connector



yes

Check voltage and control lines from ignition pulse generator.

Disconnect ignition-distributor plug after pressing the wire retainer.
Connect ohmmeter one after the other to

Ignition-distributor plug		EZ-K control-unit plug
Term. 4	and	term. 4
Term. 10	and	term. 10
Term. 24	and	term. 24

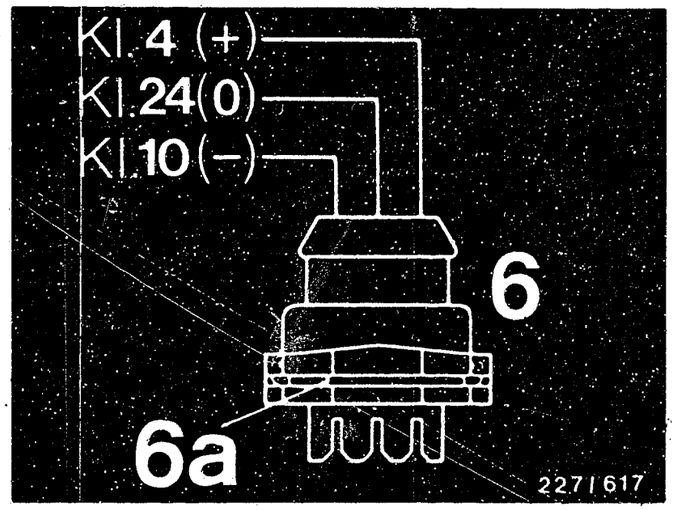
Ohmmeter must indicate approx. 0 Ω (continuity) in each case.

Resistance value O.K.?

no → Eliminate open circuit

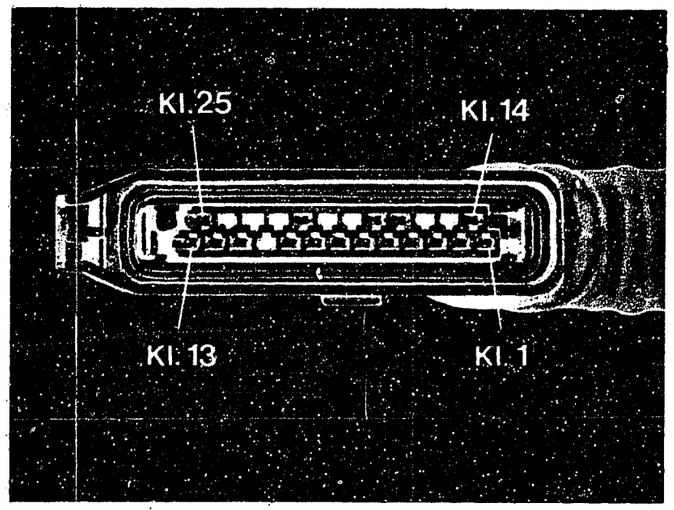
yes

Continued on E 9/E 10



6 = Ignition-distributor plug
6a = Wire retainer

EZ-K control-unit plug



yes

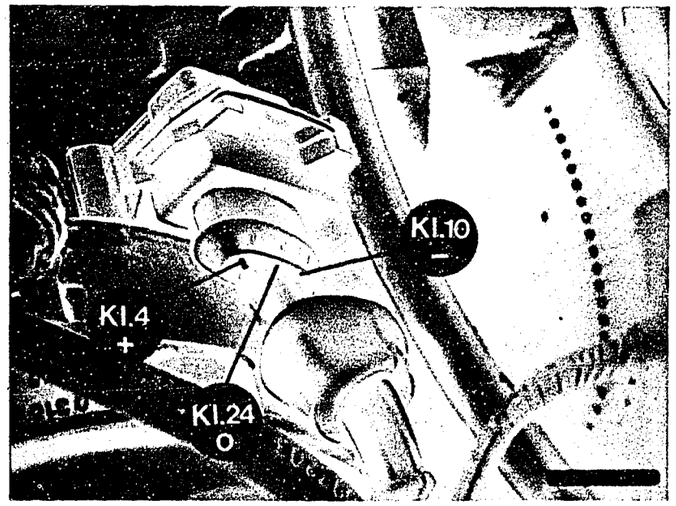
Check igniton-pulse generator power supply

Connect EZ-K control-unit and ignition-distributor plugs.

Push back rubber sleeve on ignition-distributor plug.
Connect voltmeter with test prods to term. 4 (+) and term. 10 (-). See picture.
Switch on ignition.
Measured voltage must be ≥ 10 V.

Voltage O.K.?

no → Replace control unit.



yes

yes

Continued on E 11/E 12

yes

Check operation of ignition pulse generator.

EZ-K control-unit and ignition-distributor plugs connected.

Push back rubber sleeve on ignition-distributor plug.

Connect oscilloscope as per operating instructions with program switch in "special" position.

For example MOT 201:

Red clamp with test prod to ignition-distributor plug term. 24 (measured signal). See top picture.

Black clamp to ground.

Start engine.

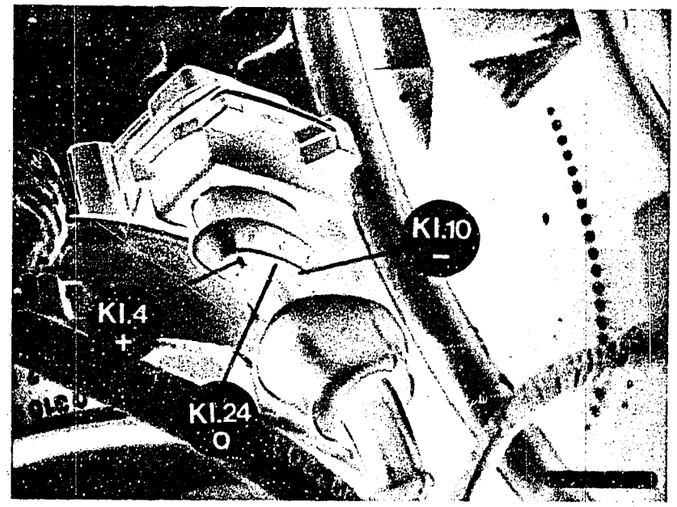
The oscilloscope must indicate a rectangular pulse. See bottom diagram.

Rectangular pulse present?

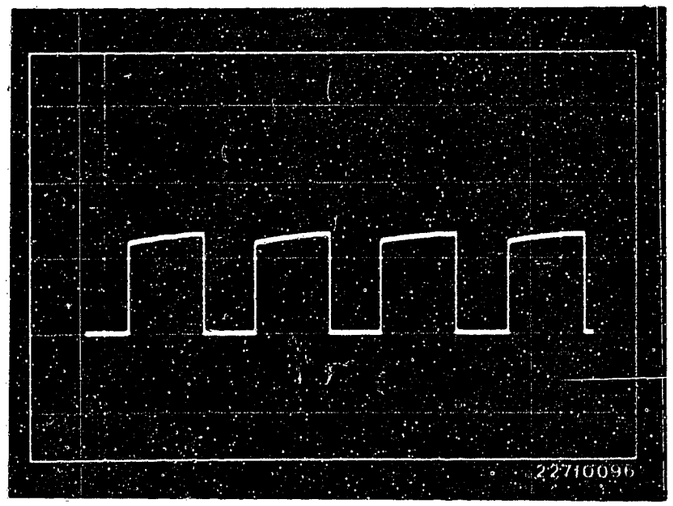
no → Replace ignition pulse generator or ignition distributor

yes

Continued on E 13/E 14



Rectangular pulse



yes

Check EZ-K control unit.

EZ-K control-unit plug and ignition-distributor plug connected.

Connect oscilloscope set to "special" range as per operating instructions.

For example MOT 201:

Red clamp one after the other to disconnected trigger-box plug term. 5 term. 6 (measured signal).

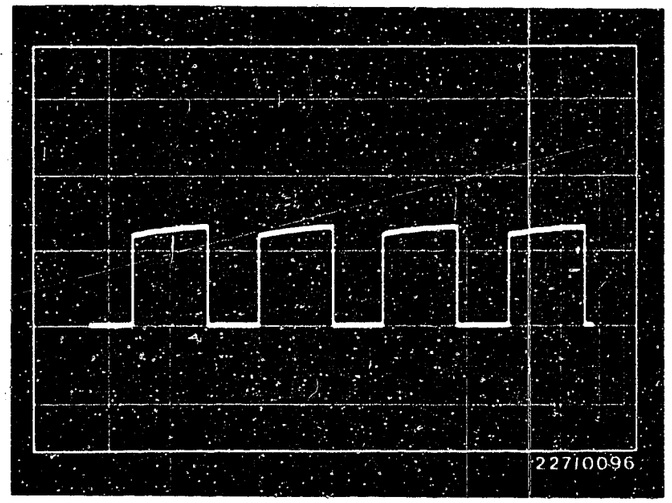
Connect black lead to ground.

Start engine.

Oscilloscope must indicate a rectangular pulse at both terminals. See diagram.

Is square wave displayed?

no → Switch off ignition. Disconnect trigger-box and EZ-K control-unit plugs.



Rectangular pulse

yes

Continued on E 17/E 18

Continued on E 15/E 16

Continued

Connect ohmmeter one after the other to:

Control unit connector		EZ-K control-unit plug
term. 5	and	term. 15
term. 6	and	term. 16

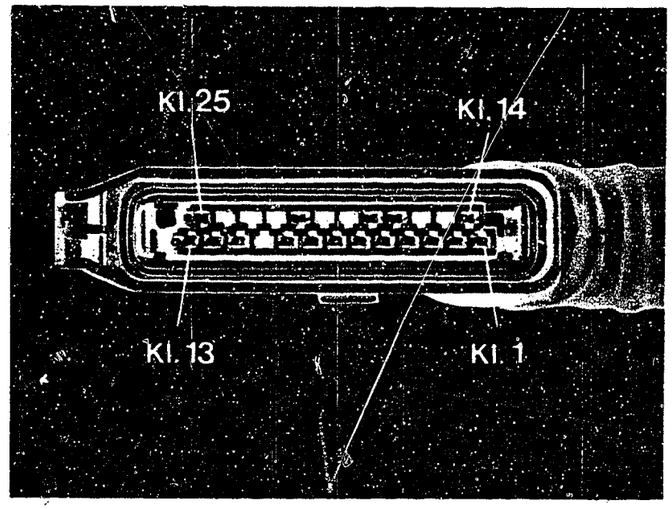
Ohmmeter must indicate approx. 0Ω (continuity) in each case.

Eliminate discontinuity.

If there was no open circuit, replace EZ-K unit.

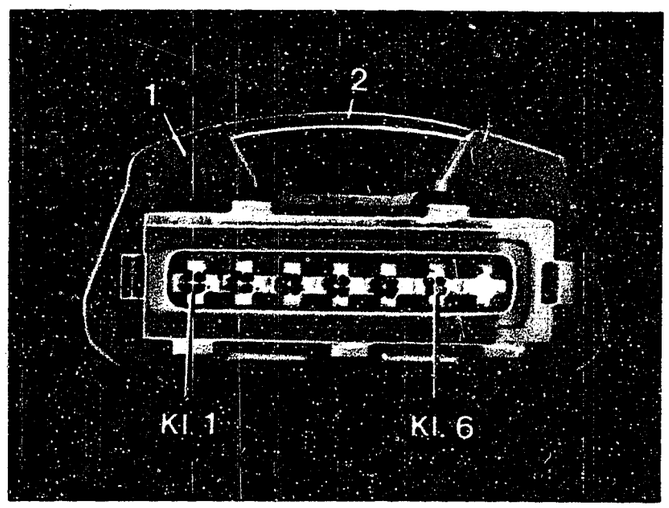
yes

Continued on E 17/E 18



EZ-K control-unit plug

Control unit connector



yes

Check ignition coil.

Visual examination:

Check whether plug (see picture) is present and whether sealing compound has escaped.

Electrical test:

Ignition coil, primary
(Term. 15 and term. 1) 0.6...1.1 Ω (take resistance of test lead and test prods into account).

Ignition coil, secondary
(Term. 1 and 4) 6.4...11.1 kΩ.

Plug present and/or no sealing compound escaped?

Resistance value correct?

no →

1. If plug not present and/or sealing compound escaped, replace trigger box, EZ-K control unit and ignition coil.

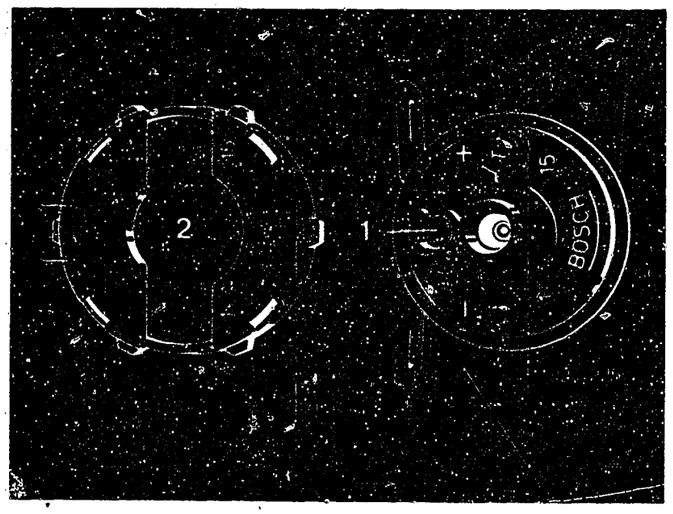
2. If resistance values are not OK, replace ignition coil.

yes

If all test steps O.K. and still no primary signal/ignition spark, try installing specified ignition coil.
If primary voltage/ignition spark still not present, re-install "old" ignition coil and replace trigger box.

Testing completed:
Tests from B17 not necessary.

Note:
If customer complaint still not remedied, further possible faults on fuel system, or engine not mechanically O.K.



1 = Plug
2 = Protective cap

After-sales Service

Technical Bulletin

22

Danger of Accident on Semi-conductor Ignition Systems

VDT-I-227/102 B

11.1976

Please be sure to pass this bulletin on to your employees for their attention.

The increased demands made on their ignition systems by modern engines, and the wish for freedom from maintenance, led some time ago to manufactures starting to equip their vehicles with semi-conductor ignition systems as original equipment. In most cases the performance of nearly all makes of such systems is higher than that of conventional systems, and further improvements are to be expected. This means that semi-conductor ignition systems have reached the point where contact with "live" parts or contacts (whether on the primary side or the secondary side) can prove fatal.

In this connection we should like to point out to you that the laws valid in your country regarding work on high-voltage systems must be adhered to when working on, or testing, semi-conductor ignition systems.

As a matter of principle, when working on such ignition systems the ignition is to be switched off. Included in such work are the following operations:

- Connection of engine testing equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).
- Replacement of ignition system parts (spark plugs, ignition coil, ignition distributor, H.T. ignition cables etc.).

If it is necessary to switch on the ignition in order to test the system or make adjustments on the engine (to the carburetor for instance), then lethal voltages are present throughout the entire system.

This means that the danger of accident exists not only at individual components in the system (e.g. ignition distributor, ignition coil, trigger box, ignition harness), but also at the wiring harness (e.g. connection for the tachometer, diagnostic connector), on terminals, and on test equipment.

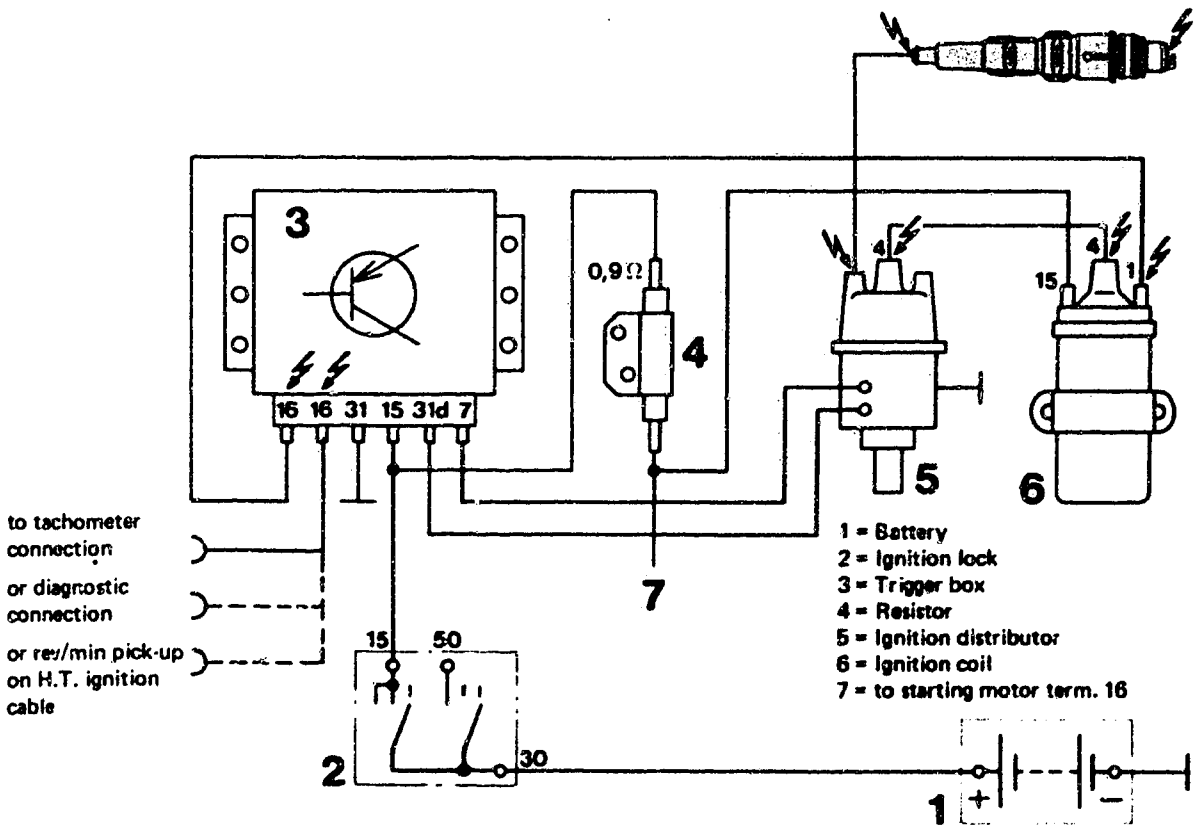
BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung

In addition, in the case of the capacitor-discharge ignition system (CDi), danger of accident is also present under the following circumstances:

- Operation of the trigger box without the ignition transformer.
- At the trigger box, (removed), relatively soon after it has been switched off (capacitor discharge).

Below is a typical terminal diagram of a semi-conductor ignition system, the danger points are marked with red high-voltage arrows. We would point out that all semi-conductor ignition systems, even the older ones, are to be regarded as dangerous in the sense as defined by this bulletin.

Please address any queries or comments concerning the contents of this publication to our representative in your country.



Terminal diagram

After-sales Service

Technical Bulletin

EFFECTS OF ELECTRICAL AND ELECTRONIC SYSTEMS ON HEART PACEMAKERS

e.g. ignition systems, Jetronic, Motronic, ABS

VDT-I-227/107 En
1.1981

Please ensure without fail that this Bulletin is passed on to your employees for their attention!

We have often been asked by some of our customers whether or not patients with heart pacemakers are endangered in any way by ignition systems. This theme was recently the subject of an examination carried out by the Ignition System Development Department of Robert Bosch GmbH in conjunction with Dr. Thull, lecturer at the Central Institute for Biomedical Technology at the University of Erlangen-Nürnberg and Biotronic GmbH & Co. of Berlin, a manufacturer of heart pacemakers. The magazine "Biomedizinischen Technik" (5/80) listed the results.

The most important discoveries in this practice can be summarized from the examination report as follows:-

1. Heart pacemakers corresponding to the latest state of the art are not affected by radiation (electromagnetic fields) from ignition systems.
2. With a stationary engine and the ignition switched off the heart pacemaker is not affected by any part of the ignition system, even when unintentionally touched. Maintenance work in the engine compartment, for example, can then be carried out without any danger.
3. With the engine running or stationary with the ignition switched on, touching current-carrying parts of the ignition system, as well as parts of any other electrical system, presents a certain danger for everybody. The heart pacemaker can here be affected under certain conditions (voltage, current and frequency).
   Patients with heart pacemakers should therefore at all costs avoid touching current-carrying parts of electrical systems.
4. Furthermore, patients with heart pacemakers are more inclined to psychic shock effects than other people, even when they receive just a harmless electric shock, because many such patients are conscious of the increased danger to the cardiac activity.

We therefore consider it inadvisable for patients with heart pacemakers to be employed in workshops or on vehicles where ignition systems are being tested or repaired. If any members of your staff have heart pacemakers please carry out the necessary measures.

BOSCH Geschäftsbereich KH. Kundendienst, Kfz-Ausrüstung.

We would like to add that heart pacemakers are not expected to be affected in any way by interference from other electronic products and systems which we manufacture, such as the Antiskid System (ABS), Jetronic, Motronic, because the much greater radiation intensity of the ignition systems examined in normal use has not caused any interference to heart pacemakers corresponding to the latest state of the art.

If you should receive questions on this matter from customers, please inform them accordingly.

After-sales Service

Technical Bulletin

KNOCK SENSOR

0 261 231 ..

VDT-I-227/110 En

3.1983

Procedures for after-sales service

Description

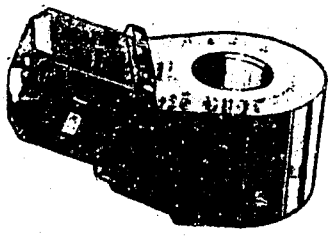
The knock sensor contains an active piezoceramic element. It is screwed to a chosen position on the engine block and sends a structure-borne signal which is processed further by an electronic control unit.

User

Saab is the first vehicle manufacturer to use the knock sensor which is being fitted to various turbo vehicles.

Components

Knock sensor 0 261 231 ... *



* The exact part numbers are given on the appropriate vehicle-equipment microcards AA... .

Service/exchange parts

The knock sensor is a service part and is supplied by Bosch. The remaining components of the knock control are products made by other firms.

Technical documentation

Technical bulletin "New product" VDT-I-227/10 En.

BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung

Training

Special training is not necessary.

Retrofitting

The knock sensor is not intended for retrofitting.

Warranty procedure

Components on which a claim is being made should be sent for inspection during the warranty period to our representative in your country. He should forward it to:

ROBERT BOSCH GMBH
KH/LAV - Auspackraum
zur Weiterleitung an K1/VAK2
7000 Stuttgart 30
Federal Republic of Germany

This regulation applies until further notice.

After-sales Service

Technical Bulletin

BREAKERLESS TRANSISTORIZED IGNITION SYSTEM 22

Warranty note VDT-I-227/103 En
Hybrid construction trigger boxes 3.1979
0 227 100 100 for ignition distributor
with Hall generator (TCI-h)
0 227 100 102 for ignition distributor
with induction-type
pulse generator (TCI-i)

Apart from the well-known TCI trigger boxes 0 227 100 0.. , trigger boxes of hybrid construction have been fitted as standard since 9.78 (Fig. 1).

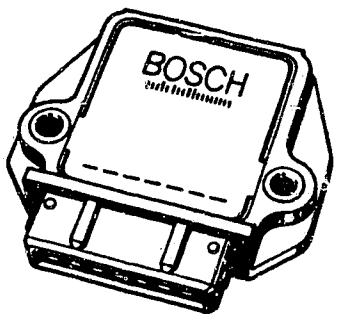


Fig. 1

Warranty procedure

If the complaints are justified, all these hybrid trigger boxes are to be sent, along with completed warranty documents, to your authorized representative for forwarding to the following address:

ROBERT BOSCH GMBH
KH/LAV - Auspackraum

zur Weiterleitung an K1/VAK 21

D-7000 Stuttgart 30

This instruction remains valid until further notice.

BOSCH Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung.

After-sales Service

Technical Bulletin

NEW DESIGNATIONS FOR IGNITION SYSTEMS

VDT-I-227/108 En
1.1983

The introduction of new ignition systems has made it necessary to reclassify all designations.

The designations listed below will be used immediately in KH workshop and sales literature.

Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Coil ignition	SZ (CI)	---------	Mechanical (breaker points)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized coil ignition	TSZ-K (TCI-c)	K=breaker-triggered	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Trigger box with conventional circuit techniques	TSZ-I* (TCI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
	TSZ-H	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
Transistorized ignition	TZ-I* (TI-i)	I=Induction-type pulse generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)
(Trigger box in Hybrid technique)	TZ-H* (TI-h)	H=Hall generator	Electronic (trigger box)	Mechanical (ignition distributor)	Mechanical (ignition distributor)

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Designation	Abbrev'd code	Meaning	Switching	Ignition control and spark advance	High-voltage distribution
Breakerless semiconductor ignition with or without knock control	EZ EZ-K	- K=Knock control	Electronic (trigger box or control unit)	Electronic (control unit)	Mechanical (ignition distributor or high-voltage distributor)
Distributor-less ignition with or without knock control	VZ VZ-K	- K=Knock control	Electronic (control unit)	Electronic (control unit)	Electronic (dual-spark ignition coil, or 1 ignition coil for each spark plug)

*Note: The ignition system can also be equipped with a DLS unit (digital idle stabilization) or with an ELS unit (electronic idle stabilization) or with an ESV unit (electronic ignition retardation).

After-sales Service

Motor Vehicle Service Information

MOTORTESTER CONVERSION
Incorrect display of rotational speed, dwell angle and ignition point only with trigger boxes 0 227 100 ... (TCI-i, TCI-h) with current limitation

VDT-I-Gen. 032 En
6.80

For additional information see VDT-I-Gen. 030 of 6.80

Re.: Motortester EFAW 268
268 S 10
269
214 B
AE 2000

1. General

Please make sure that the above-mentioned motortesters in your workshop and at your customers (e.g. motor vehicle workshops, oil companies, gas stations, vocational schools etc.) are converted. The conversion is subject to payment and is carried out by the K7 after-sales service of the responsible BG. The standard time is 15 work units (with fitting of switch).

2. Why motortester conversion?

In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system. There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing light is triggered by the signal path dwell angle - meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing light is triggered by the clamp-on induction pickup and the pulse shaper stage.

BOSCH Geschäftsbereich KH Kundendienst Kfz-Ausrüstung

2. Test instructions

2.1 Rotational speed

Incorrect rotational-speed display can be recognized as follows:

If one starts at the idle speed and slowly increases the engine speed, then the incorrect display can be recognized by an abrupt reduction in the rotational-speed display (e.g. from 2400 min^{-1} to 1200 min^{-1}).

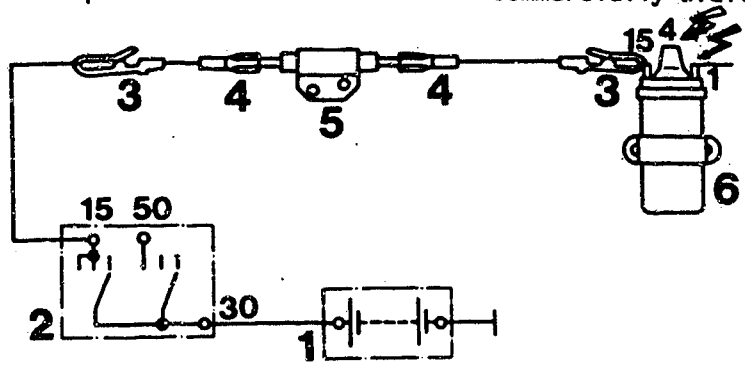
It is, however, possible to attain correct rot.-speed measurements as follows:

Connect a ballast resistor of 0.9 or 1.0 Ohm (see Fig.) in series in the line to term. 15 of the ignition coil (take care not to cause a short circuit). After the rotational-speed measurement, the ballast resistor must be removed (otherwise starting difficulties and misfiring). Connect tester as per operating instructions.

Suggestion for user manufacture

Required parts:

1 ballast resistor 0.9 Ohm	Part No. 0 227 900 002
or	
1 ballast resistor 1.0 Ohm	Part No. 0 227 900 101
2 blade receptacles e.g.	Part No. 1 901 355 881
approx. 0.2 m cable, 1.5 mm^2 e.g.	Part No. 6 210 150 150
2 insulated clips	Commercially available



1 = Battery
2 = Ignition switch
3 = Clips
4 = Blade receptacle
5 = Ballast resistor
6 = Ignition coil

approx. 400 V

approx. 25 kV

2.2 Dwell angle

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

2.3 Ignition point

Is displayed correctly. Connect tester as per operating instructions.

After-sales Service

Motor Vehicle Service Information

MOTORTESTER CONVERSION
Incorrect display of rotational speed, dwell angle and ignition point only with trigger boxes 0 227 100 ... (TCI-i, TCI-h) with current limitation

VDT-I-Gen. 032 En
6.80

For additional information see VDT-I-Gen. 030 of 6.80

Re.: Motortester EFAW 268
268 S 10
269
214 B
AE 2000

1. General

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In comparison with conventional ignition systems, transistorized ignition systems with current limitation have different primary voltage characteristics. During the dwell period the voltage at terminal 1 of the ignition coil may assume values from 1.5 V to battery voltage (or greater). This may lead to an incorrect display of rotational speed and dwell angle as well as to incorrect triggering of the meter when testing the ignition system. There is, however, no functional defect in the ignition system, and, for this reason, the trigger box must not be replaced. Since, with the above-listed motortesters, the timing light is triggered by the signal path dwell angle - meter, this incorrect triggering also leads to incorrect flashing and thus to an incorrect display of the advance angle.

3. Conversion measures

The situation is to be remedied by modifying the wiring of the testers so that the timing light is triggered by the clamp-on induction pickup and the pulse shaper stage.

BOSCH
Geschäftsbereich KH Kundendienst Kfz-Ausrüstung
by Robert Bosch GmbH D-7 Stuttgart 1 Postfach 50 Printed in the Federal Republic of Germany
Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

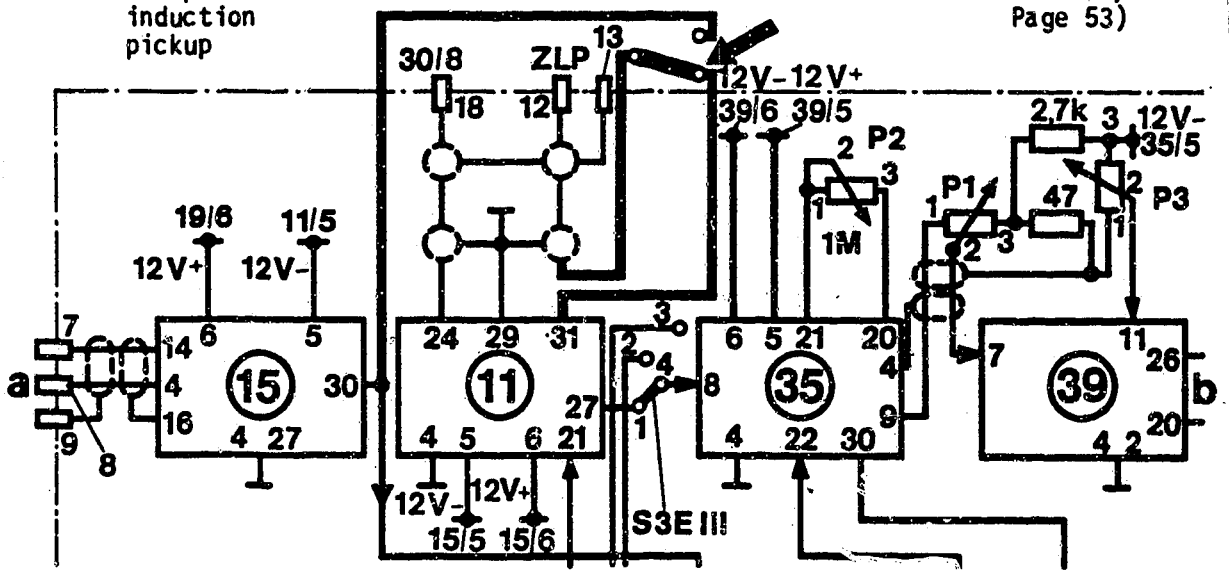
EFAW 268, 268 S 10, 269, AE 2000

Remove the line of the ZLP* from pin 31 of printed board 11 (coupling stage) and connect to pin 30 of printed board 15 (pulse shaper stage) via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 11 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.

* ZLP = timing light

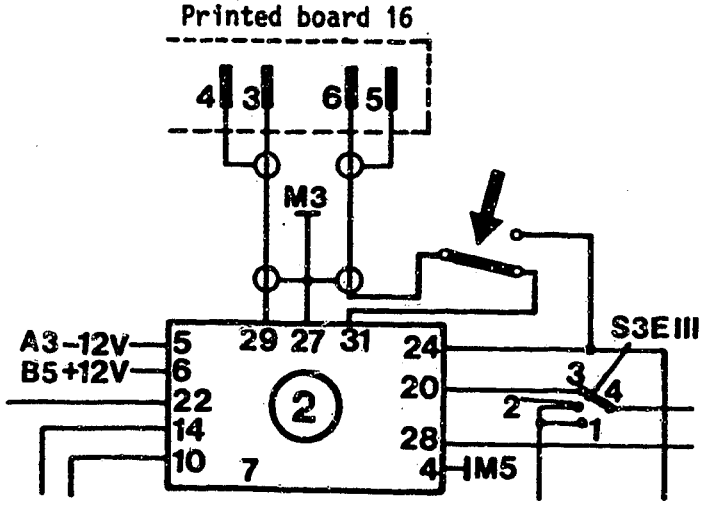
a = Clamp-on induction pickup

b = (Extract from WJF 508/1 Page 53)



EFAW 214 B

Remove the line from terminal 6 of printed board 16 to pin 31 of printed board 2 (coupling stage) and connect to pin 24 of the same printed board via a switch with change-over contact (e.g. 0 341 500 803). In addition, a new line must be connected from pin 31 of printed board 2 to the other contact of the switch with change-over contact. Arrow points to switch with change-over contact.



(Extract from WJF 503/1, Page 64)

By fitting the switch with change-over contact in the front panel of the motor-tester, it is possible to switch over from standard ignition systems to those with current limitation. We recommend that the switch positions be marked correspondingly: e.g. "standard" - "current limitation".
These conversion measures have already been published in the K7 information sheet KJF 28/7911.

4. Test instructions

4.1 Standard ignition systems

Switch position: "standard"
All other tester connections as per operating instructions.

4.2 Ignition systems with current limitation

Switch position: "current limitation"

In order to trigger the timing light, the induction-type pulse generator (clamp-on pickup or red pickup) must always be connected during the measurement.

The selector switch for ignition systems built into the motortester must be switched to standard coil ignition (not to TCI) with these ignition systems.

All other tester connections as per operating instructions.

The dwell angle is electronically controlled. A measurement of the dwell angle is no longer performed.

After-sales Service

Motor Vehicle Service Information

TESTS ON ELECTRONIC IGNITION SYSTEMS
(TCI, TZ)
TESTER INSTRUCTIONS

VDT-I-Gen. 035 En
3.1981

The following tests are listed in older and current Tester operating instructions or in Trouble-shooting with the oscillograph.:

- "Separate ignition coil test" (concerns EFAW 213, 214, 268, AE 2000).
- Calculating the "ignition voltage reserve" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).
- "Intensified insulation test" (concerns EFAW 213, 214, 268, AE 2000 and MOT series).

Nowadays transistorized ignition systems deliver more than 30,000 V secondary voltage.

To avoid damage to ignition coil, ignition cable and ignition distributor by voltage flashovers, the tests listed above should not be carried out on transistorized ignition systems.

The contents of this Service Information has already been published in the K7-Information K7-VJF 17/8012.

BOSCH Geschäftsbereich KH. Kundendienst. Kfz-Ausrüstung

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